UNIVERSITY OF PRINCE EDWARD ISLAND

Renewable Energy in the Food, Energy, Water Nexus of the Bahamas

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A THESIS

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Abstract

As the global population increases, so does global demand for energy, water and food expand. Meeting this continual spike of demand presents a tremendous challenge to Small Island States, given competing needs for limited resources amid heightened climate change. In order to overcome the increasing constraints that Small Island States encounter, serious consideration must be given with respect to how Small Island States produce and consume energy, produce water and provide food to their citizens. This critical tri-partied interaction is known as the Nexus. The interlinkage between the water, energy and food supply systems is a major consideration in countries' sustainable development strategies. Rapid economic growth, expanding populations and increasing prosperity are driving up demand for energy, water and food, especially in the Small Island States in the developing countries.

Advancements in renewable energy technologies provide access to cost-effective, secure and environmentally sustainable supplies of energy. Their rapid technology advancements can have substantial spill-over effects in the water and food sectors. Yet detailed knowledge on the role renewables can play in the management of the Nexus remains limited and widely dispersed, let alone aggressively practiced or not practiced in small island countries such as the Bahamas. Renewable energy technologies could address some of the trade-offs between water, energy and food, bringing substantial benefits in all three sectors.

The objective of the Thesis is to explore whether Small Island States such as the Bahamas are taking full advantage of the current technology available to manage their Nexus. The Thesis primarily uses government policies and press reporting on Bahamian renewable energy projects, and how these programs influence the water, energy and food requirements for the Bahamas.

The term “energy-water-food Nexus” refers to the complex interdependencies between energy, water and agriculture that vary by geography.

The Nexus refers to the web of interactions that link energy, water and food in a common system, as growing food requires water, processing water requires power, and hydro-electric power generation requires water. Depleting the natural resources of islands to the point of annihilation is verifiable in island countries such as the Easter Islands. Small islands are a microcosm of the Earth. To study small island Nexus topics is an opportunity to understand the challenges experienced all over the world.

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Please note that all correspondences, legislation and facts are current as of March 31, 2015. Any errors or omissions are the fault of my own, and I look forward to continue to delve into and assist the opportunities for sustainable islands.

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Chapter One: Introduction

1.1 Thesis Significance

The significance of my research is important and timely. Understanding island management of the Nexus is analogous to understanding the Nexus challenges and opportunities for the Earth. Island states such as the Bahamas can be considered analogous to studying the whole world.

The Nexus

Symbiotic Interconnectivity of Food, Energy & Water
(Water Nexus Solutions)

(World Information Transfer)

Purpose of the Thesis

This Thesis seeks to explore Nexus needs of Small Island States such as the Bahamas, in order to form business and policy strategies, and most importantly to assist Small Island States to be more

resilient to energy, water and food shortages and challenges now and into the future.

The Thesis also seeks to understand the interconnected nature of the Nexus, as well as assessing risk and opportunities of current consumption of resources. Implementing technologies and programs to mitigate risk, is its goal for the future survival of Small Island States like the Bahamas.

The further purpose of the Thesis is to explore whether Small Island States such as the Bahamas are taking full advantage of the current technology available to manage their Nexus. As the global population increases, so does global demand for energy, water and food expand especially on Small Island States. Meeting this continual spike of demand presents a tremendous challenge to Small Island States such as the Bahamas, given competing needs for limited resources amid heightened climate change effects.

In order to overcome the increasing constraints that Small Island States like the Bahamas encounter, serious consideration must be given with respect to how Small Island States produce and consume energy, produce water and provide food to their citizens. The interlinkage between the water, energy and food supply systems is a major consideration in countries' sustainable development strategies. Rapid economy growth, expanding populations and increasing prosperity are driving up demand for energy, water and food, especially in the Small Island States in the developing countries.

Advancements in renewable energy technologies can provide access to cost-effective, secure and environmentally sustainable supplies of energy. Their rapid technology advancements can have substantial spill-over effects in the water and food sectors. Yet detailed knowledge on the role renewables can play in the management of the Nexus remains limited and widely dispersed, let alone aggressively practiced or not practiced in small island countries such as the Bahamas. Is the Bahamas using currently available renewable energy technology to its fullest potential? Renewable

energy technologies could address some of the trade-offs between water, energy and food, bringing substantial benefits in all three sectors. Yet, the current significant economic reliance on visitors coming to the Bahamas representing over 60% of its GDP puts the whole system on shaky foundations. As the chart below illustrates, the diverse monthly numbers are wide and unpredictable. Managing the Nexus with an economy built on one industry that shifts and ebbs depending on factors external to the country, is like trying to pull in a sail that is flapping in the wind. Without a taunt sail, the craft cannot go forward.

1.2 Why Study the Bahamas Nexus?

The Bahamas is a good example of a Small Island State that suffers from over-population in the central capital city of Nassau, the importation of most of their food stuffs, the burning of imported fossil fuels to create much needed energy for their population, the importation of water for human consumption, importation of managers and other professionals to manage their main industry of tourism and off-shore banking, and the resulting high deficit funding required to maintain an importing economic structure. Not only is the Bahamas a major importers of most

commodities that it consumes, it is also an exporter of its well educated youth, who seek a better life off island.

Small independent island states such as the Bahamas are much different than small non-sovereign island states such as Curacao or Aruba of the Dutch Antilles. The Bahamas gained its total independence in 1972, the year it elected its first Prime Minister. It does not receive transfer payments from Great Britain, nor does it possess free trade opportunities with its Colonial parent country. The Bahamas is an important study because it sits as a totally independent country with limited natural and financial resources, similar to other independent Small Island States. Its lack of benefactor places it in a most vulnerable position from a financial perspective. Its educational institutions, the backbone of any civilization, are home grown, and funded by the government or in the case of private schools, by the parents of its students. The statehood of an independent jurisdictional country such as the Bahamas has no tethers to its colonial roots to depend on at any level of its existence. Can it survive?

1.3 Brief History of the Bahamas

Historically, the Bahamas has had numerous owners and occupiers of its lands. Like many of the Caribbean islands, the Bahamas history is similar to a constant changing of the guards, from Spanish conquistadores, to Dutch freebooters, to English pirates.

The Bahamas evolved as a result of the adaptation of migrant peoples, first from South America, then from Europe, Africa and North America, to and through a difficult marine environment. The challenges of the sea, and its over-riding importance compared to its less-fertile islands with meager resources; the challenges living between the world's two largest super-powers of Spain and England; the abilities to seize opportunities of fortune when they presented themselves; the co-existence of hash racial and social divisions; the very long walk to political and economic freedom and political independence of their own, all have contributed to the Bahamian reality of today. (Craton, Michael, et. al page xxii)

The Bahamas officially known as the Commonwealth of the Bahamas, is an island country consisting of more than 700 islands, cays, and islets in the Atlantic Ocean; north of Cuba and Hispaniola (the Dominican Republic and Haiti); northwest of the Turks and Caicos Islands, southeast of the U.S. state of Florida and east of the Florida Keys. Its capital is Nassau on the island of New Providence. The designation of "Bahamas" can refer to either the country or the larger island chain that it shares with the Turks and Caicos Islands. As stated in the mandate manifesto of the Royal Decree, the Bahamas territory encompasses 700,000 km^2 (180,000 sq. mi) of ocean space.

Lucayan Indians inhabited the islands when Christopher Columbus first set foot in the New World on San Salvador in 1492. Originally inhabited by the Lucayans, a branch of the Arawakan-speaking Taino people. Although the Spanish never colonized the Bahamas, they shipped the native Lucayans to slavery in Hispaniola. The islands were mostly deserted from 1513 until 1648, when English Colonists from Bermuda settled on the island of Eleuthera.

French, Spanish and English colonists were more attracted to the fertile land of Virginia, some islands in the Caribbean such as Hispaniola, and South America. The 700 islands of the Bahamas were treacherous for its shoals, and lacked rich earth for farming.

Not until the time of the 30 Years War, when the Dutch, the French and England were attempting to dominate the oceans did England finally claim the Bahamas as its own. In 1629 the Royal Decree British settlement of the islands began in 1647. The grant gave proprietary rights to Sir Robert Heath, Attorney General to Charles 1, for the Carolinas and the Bahamas. The first

actual settlers to the islands came from Bermuda, led by William Sayle, in 1648. The settlers had formed a company called the Eleutherian Adventurers, taken from the Greek word for freedom. (Johnson, pg. 4) The Bahamas system of government evolved based on the King's grants of lands to proprietors. For obvious reasons these proprietors were close to the Crown, the hand that giveth. A Governor was appointed from the group of proprietors, who then appointed the numerous administrative positions. Later, members of the Assembly were elected by the freemen of the islands. (Johnson, pg. 4) During this early period of English colonization, the Bahamas was a simple, rough and marauding landscape, where favours from the Crown were the means to island power.

During the 17th century, English, France, Dutch and the Spanish corsairs plagued the seas with the legal rights of buccaneering privateers.

In 1684, a Spanish force attached and leveled New Providence.

The practice of privateering evolved into open piracy, which saw the fine harbours of New Providence and numerous other harbours in the Bahamas home to many pirates of the day. (Johnson, pg. 4) During the 30 Years War, all player nations had exhausted their treasuries. This forced their military personnel to loot and rob for their food supplies. This activity for survival also played itself out on the seas, were certain vessels were provided legal commissions to loot enemy vessels. Much of Bermuda and Bahamas's wealth came from the practice of privateering American and Spanish merchant vessels.

With the American War of Independency concluded in favour of the rebels, many American colonialists fled to the Bahamas in order to maintain their British ties and privileges.

By 1786, the population of the Bahamas had grown to approximately 9000, with blacks far out-numbering whites 6000 to 2995. (Johnson, p. 7) The Bahamas became a British colony in 1718 when the British clamped down on piracy.

American slaves and Black Seminoles escaped to the islands from Florida, and nearly 500 were freed from American merchant ships in the domestic trade by the Royal Navy. Slavery in the Bahamas was abolished in 1834. The Bahamas became an Independent Commonwealth realm in 1973, retaining Queen Elizabeth as its monarch.

Mimi Sheller puts forth an interesting historical connective when she suggests that by following in the footsteps of the explorers, the planters, and the armed forces, the tropical holiday in the sun became a safe new means of consuming the Caribbean environment. (Sheller 2001) The imbalance of production and consumption is more than apparent to this day.

The Bahamas does not have a natural resources mineral extraction or food stuff industrial base. They import all housing essentials, all autos and trucks, energy, electrical items, shoes, TVs, radios, cellular phones, and cement. They have very little in the form of domestic manufacturing. Nevertheless, Bahamians are totally consumed by the wave of sweeping globalization. The high rate of narco-crime is a result of the youth yearning for western goals. It is time to act, before much needed oil supplies run out or are so expensively priced that islands such as the Bahamas cannot purchase this commodity. It is time to act now, to create an agricultural food base to feed its population. It is time to act now to create programs of 'waste to

energy' in order to use any forms of municipal solid waste for the creation of electricity, as technology is available to produce energy from any mass item found in garbage. It is time to act now to use modern desalination technology to convert the Caribbean water into drinking water, alleviating the need to import fresh water from Florida.

By looking to its people for Nexus programs, costs for these services will drop and domestic employment levels will increase. One of the leading contributors to the destruction of the Bahamas social fabric is the ever increasing levels of crime. Levels of crime will drop significantly with new employment opportunities for the creation of internal projects to encourage the healthy balance of the Nexus of food, water and energy.

On January 12, 2015, Governor General Her Excellency, Dame Marguerite Pindling, GCMG, Governor General Commonwealth of The Bahamas described Majority Rule Day to the country. Her address to young Bahamians provided an historical over-view of the events that led up to the independence of the Bahamas. Below is an edited version of her speech.

1.4 My Dear Young Bahamians:

On October 11th 2013, for the first time in our history, a Bill was signed by the Governor General in a public ceremony attended by the Prime Minister, Cabinet Ministers, Senators, Members of Parliament, Members of the Judiciary and other officials and leading citizens. That Bill was for an Act to make January 10th, Majority Rule Day, a public holiday.

This was done in order to establish this day as perhaps the most important in our history since the abolition of slavery on August 1st, 1834.

On the 10th of January 1967 the will of the majority of Bahamians was freely expressed in a general election based on universal adult suffrage where all adult citizens could vote freely to

determine who would govern our country.

Majority Rule Day memorializes what was, in a sense, a Second Emancipation, since that was the day when people of African descent, who made up the majority of the population of The Bahamas, were enabled for the very first time to form the government.

That event removed the last psychological shackles from the minds of many; it shattered false notions of superiority or inferiority; it initiated the fulfillment of the promise of universal access to education; it created the foundation upon which to build a society with opportunity for all; it unleashed the hitherto brutally-suppressed but powerful entrepreneurial instincts of a people; it freed many Bahamians from the fear of one another because of differences of colour or ethnic origin; it opened the possibility of fully sharing and nationalizing a rich and diverse cultural heritage; and it held forth the promise of a new kind of political culture in which no Bahamian would ever again be made to suffer for exercising his or her right to free association.

It had been a long, hard struggle. Slavery had been abolished in 1834 and men of colour had sat in the House of Assembly since the 19th century. But the majority still suffered from political, social and economic discrimination, and a blatantly unfair electoral system prevented them from achieving true representation in the House of Assembly.

In 1833 Stephen Dillett, who was born in Haiti, became the first man of colour to be elected to the House of Assembly. From that time up until the 1950s there was only a handful of representatives of African descent in the House of Assembly.

Among the important events to remember after the Burma Road riot are: the formation of the Citizens Committee in 1950 which reversed the ban on the showing of Sidney Poitier's film, No Way Out; the formation of the first national political party, the Progressive Liberal Party, in 1953; the election of the first organized political party, the PLP, to the House of Assembly in

1956 with Sir Lynden Pindling as Leader; Sir Etienne Dupuch's anti-discrimination resolution in the House of Assembly in 1956 which was the catalyst for dismantling racial segregation in public places; the General Strike of 1958 led by Sir Clifford Darling and Sir Randol Fawkes; women voting for the first time in 1962 following a suffrage campaign led by Mary Ingraham, Eugenia Lockhart, Georgiana Symonette and Dr. Doris Johnson; Black Tuesday, April 27th 1965, when Sir Lynden, Leader of the Opposition, threw the Speaker's mace out of the window to protest the way constituency boundaries were drawn; a boycott of the House by the PLP in that same year; and the presentation of a Petition to the United Nations Committee on Decolonization in New York by a delegation of eight led by Sir Lynden.

On the evening of January 10th 1967, the results slowly trickled in.

There was a tie between the two political parties: 18 for the PLP under Sir Pindling; 18 for the UBP under Sir Roland Symonette; Sir Randol Fawkes representing the Labour Party and Sir Alvin Braynen, an independent, were also elected.

Sir Randol, a member of the progressive movement who ran unopposed by the PLP, and Sir Alvin joined with the PLP to form a government, and for the first time in the history of The Bahamas we had majority rule. People took to the streets shaking cowbells and beating goatskin drums as they marched from Over-the-Hill to Bay Street.

In 1969 the Bahamas got its second Constitution extending internal self-government and in December 1972 a Bahamian delegation of Government and Opposition members negotiated with the British Government the Constitution which, on July 10th 1973, gave full independence to the Commonwealth of The Bahamas. I conclude with some words of Sir Lynden Pindling spoken at the Anglican Diocesan Youth Conference in 1990 which are appropriate for Majority Rule Day:

"... Freedom does have a price. It is not free. Freedom means responsibility, a responsibility to

properly look after our families and ourselves; and citizenship demands more than simply paying taxes and voting for one's leader. In addition, each of us has a sacred duty to love and protect this blessed land God has given to us, to build it up and make it better for future generations. All of us have a stake in being Bahamian."

God bless you and God bless the Commonwealth of the Bahamas. (Bahamas Information Services)

1.5 Political Parties

Since Independence in 1973, the Bahamas had a democratic system based on the British Westminster parliamentary model of government. Its Constitution proclaims the Bahamas a sovereign democratic state; sets requirements for citizenship; guarantees fundamental human rights; establishes the executive, legislative, and judicial branches of government; and creates three civil service commissions: the Public Service Commission, the Judicial and Legal Commission, and the Police Service Commission. Although an independent member of the Commonwealth of Nations since 1973, the Bahamas retains the British monarch as its chief of state, represented in the Bahamas by an appointed governor general, similar to Canada. (Meditz, 1987)

In its Chapter III (Articles 15-28) of the Constitution details the protection of fundamental rights and freedoms in the Bahamas, including the right to life, liberty, security, and protection of the law; freedom of conscience, expression, assembly, and association; and protection of the privacy of the home and other property from deprivation without compensation. Moreover, the Constitution provides for protection of these rights and freedoms without discrimination based on race, national origin, political opinion, color, creed, or sex. These provisions were not just theoretical considerations but were actually carried out in practice, according to the Department of State's Country Reports on Human Rights Practices for 1986. (Meditz, 1987)

Is it really “better in the Bahamas” as the commonly recognized marketing jingle proclaims?

Or, better rephrased: "will it be better in the future in the Bahamas? This is the important focus issue at hand. Is island life sustainable, using the Bahamas as the test country?

To the occasional visitor, islands can appear tranquil, serene, peaceful and soothing to the body and mind. Tales of Daniel Defoe's Robinson Caruso, Robert Michael Ballantyne's The Coral Island, and Robert Louis Stevenson's Treasure Island represented popular reductive representation of tropical islands over the centuries, originating from the European imperial powers. (Deloughrey, 2004) Yet, as a participant student of island studies, one will better understand the true nature of an island's reality, where the size, insularity, remoteness, dependence and trends toward natural occurrences of disasters are prolific. Certainly, throughout history, islands have functioned ideologically as "…the new 'Eden', a socio-political utopia, 'refreshment' stop for long maritime journeys…" (Deloughrey, 2004) Such strong forces beyond the control of the islanders leave them constantly vulnerable to outside influences. (Briguglio, 1995) All is not always what it seems on a beautiful island, if you dig deeper than the gated community or an all-inclusive resort.

This Thesis attempts to address and expose intertwined challenges with integrated synergistic solutions. Such solutions cannot be developed nor implemented without cooperation across different academic sectors, various industries, and an international network of countries, cultures and people. My personal background and professional bias as a Caribbean islander is as a funder and technology provider of renewable energy systems on island states, particularly in the Bahamas. Within these pages you will read about real life food, water and energy challenges on Small Island States.

At this outset, I will take the bold step to declare that I am confident that there are real time

solutions available today to face the challenges of food, energy and water on island states.

This paper focuses on the benefits of a holistic approach to challenges in the food, water and energy-sector, as well as the challenges themselves. As our global population pushes toward 8 billion people, many of which live on islands, the increased food demand must be met with innovative thinking and an efficient agricultural and aquaculture sector. Research and development efforts go well together with environmental activities aiming at solving one of our times' most important challenges, how to sustain itself and its future ever-increasing populations.

The Bahamas is an excellent case study for this Thesis as it is full of many of the food, water and energy challenges that most islands are currently facing. The Bahamas is mainly a coral-based country, where most of its food is imported from away. Its water supply is not currently indigenous so it is taxied from away. It does not currently have an indigenous energy supply, so it imports fossil fuels in order to generate its electric needs. It has most if not all of the challenges of most island countries in the world. The Bahamas is an excellent microcosm of challenges experienced around the globe. North Americans are familiar with the Bahamas as it sits so close to Florida State, less than 70 miles away.

Technology has recently produced solutions to many of these challenges. The Bahamas, like most islands, have water, food and energy challenges that have created mountains of country debt, pollution and below subsistence living standards of many of its citizens. Yet, these challenges also create opportunities for education and technology to empower the Bahamians toward treating these challenges as opportunities for new employment and higher standards of living.

By using seawater and solar energy technology, future larger scale research and commercialization platforms can be created in the Bahamas in areas of horticulture, freshwater

generation, energy production, and algae production. These future projects can pave the way for commercialization of numerous green technologies for large scale implementation with a vision to produce its own energy, food and fresh water for tomorrow's Bahamas' population in a sustainable manner.

1.6 Research Questions

My research questions are positioned to create clarity on the Bahamian management of their Nexus. The four questions are:

1. Is there evidence in the Bahamas of current fundamental solutions in place to sustain the Nexus, or just posturing and rhetoric?
2. Is there evidence that the Bahamas is transforming their water and food sectors?
3. Is there evidence that the Bahamas is transforming their energy sector?
4. Are the Bahamian government ministries truly dedicated to the Nexus development?

1.7 Theoretical Approach

I have researched different considerations to using the theoretical approach to my Thesis. I have discovered that a theoretical framework guides research, determining what variables to measure, and what statistical relationships to explore. (Trochim, 2006)

In the Research Methods Knowledge Base, there are two realms involved in research, first being theory and the second being observation. In the study of the Nexus, these two approaches cause much of congestion, which I call inaction.

Theory, though important, is what goes on in a classroom or at a black board. And often that is where it stays. At the opposite end is observation, noting what goes on in the real world of

actions. In conducting research, one works with and between these two realms. Theory is step number one in the sustainable development process, and guides every aspect of research, from formulation of the research question through operationalization and discussion.

My use of a theoretical framework should strengthen and organize my research. I will state explicit statement of the theoretical assumptions permits them to be evaluated critically.

The theoretical framework connects me the researcher to existing knowledge. Guided by a relevant theory, researchers have a basis for their hypotheses and choice of research methods.

Articulating the theoretical assumptions of a research study forces me the researcher to address questions of why and how. It permits me as researcher to move from simply describing a phenomenon observed to generalizing about various aspects of that phenomenon.

Using a theory can assist to identify the limits to those generalizations. A theoretical framework specifies which key variables influence a phenomenon of interest. It alerts me to examine how those key variables might differ in varied populations. The Thesis title, by its nature identifies the research challenge. I then reflected on the key variables in my research. I asked myself to research and identify which factors contribute to the presumed effect of action or inaction of sustainable goals.

(Guardian, 2012)

1.8 Research Methodology

This research was conducted in order to determine whether the theory of the Nexus as postulated as a serious opportunity for island water, food and energy management is actually being implemented effectively in the Bahamas. Using the four research questions as our measurement tools, we used the Bahamas as a case study for Small Island States. The empirical observations were conducted through the lenses of my three decade expert involvement in the energy verticals, as well as numerous news and research reports of Nexus related actions.

I bring extensive experience to this topic, having solar energy and 'waste to energy' project experience in the Caribbean, Africa, Canada and Asia, and have been called to council governments and companies with their energy goals and challenges..

The advantages and disadvantages as well as the reliability of this methodology as a prime mover to action were also part of the objectives. In order to answer these 4 research questions, I as researcher focused on researching the water, energy and food Nexus in the Bahamas as they attempted to fulfil these goals. The descriptive method of research was used for this study. To define the descriptive type of research, Creswell stated that the descriptive method of

research is to gather information about the present existing condition. (Creswell, 1994)
The emphasis is on describing rather than on judging or interpreting. The aim of descriptive research is to verify formulated hypotheses that refer to the present situation in order to elucidate it. The descriptive approach is quick and practical in terms of the financial aspect. Moreover, this method allows a flexible approach, thus, when important new issues and questions arise during the duration of the study, further investigation may be conducted. Descriptive research on the other hand is a type of research that is mainly concerned with describing the nature or condition and the degree in detail of the present situation. This method is used to describe the nature of a situation, as it exists at the time of the study and to explore the causes of particular a phenomenon. The aim of descriptive research is to obtain an accurate profile of the people, events or situations. With this research type, it is essential that the researcher already has a clear view or picture of the phenomena being investigated before the data collection procedure is carried out. The researcher used this kind of research to obtain first hand data so as to formulate rational and sound conclusions and recommendations for the study. The descriptive approach is quick, practical and allows for the gathering of much data in an efficient manner.

2.0 Bahamas Actions for Sustainable Goals

On August 14, 2013 the Minister of Environment and Housing, Minister Kenred Dorsett M.P. declared that his government was actively moving forward to with a new energy strategy that will wrap affordable and efficient energy services to the residents of the Bahamas. (Bahamas Government, 2013) If this statement by Minister Dorsett was true, then he would satisfy Research Question # 4. Yet, to date there is no evidence that he has put his words to action. Minister Dorsett's statement was quickly followed by Prime Minister Perry Christie releasing a statement on August 15, 2013 where he outlined his plans to move forward in reforming

the energy sector of the Bahamas. (Bahamas Government, 2013). That statement was made in 2013. Similar to Minister Dorsett, Prime Minister Christie would be satisfying Research Question # 4. Yet, there is no evidence that he has gone beyond rhetoric at this time.

The energy costs charged to electricity users in the Bahamas are among the highest charged in the world, averaging approximately 40 – 50 cents per kilowatt.

2.1 Bahamas Charter of Governance 2012

Rhetorically, the Progressive Liberal Party promises to make energy more affordable for the citizens in their Charter for Governance. In the Prime Minister's statement released on reforms for the energy sector, the government plans to create the following innovations:

1. An energy sector that provides affordable energy supplies to all customers with the capacity to meet the long term growth in the demand for energy.
2. An energy sector that is 30% powered by renewable energy by 2030 including 10% of the sector's power to come from residential energy self-generation. (Charter of Governance, 2012)

This will mean that consumers will be able to generate their own energy to power their homes through solar, wind and other types of renewable energy sources to be fed into the grid. Not only will this aid in reducing the cost of energy to consumers and reducing the demand for publicly generated energy. It will also allow for a possible energy credit programme to be introduced. This announcement is also good news for persons who would like to enter the energy sector as entrepreneurs as one of our objectives is to provide investment opportunities for Bahamians and spinoff opportunities within the nation's economy.

The Charter of Governance calls for the reduction of the cost of energy, because the cost of energy is very high. Citizens are paying more for their energy than for their mortgages in many cases. How can the Bahamas attract businesses to their country with such high electricity? costs, that is primarily based on the trading and widely fluctuating oil commodity?

The Charter describes the reasons for the high cost of electricity, which include:

1. Incredible mismanagement at The Bahamas Electricity Corporation. For example, independent consultants have established that the cost of electricity and the unacceptable level of blackouts are being caused in part by a failure to properly maintain equipment, including failure to replace parts due to the non-payment of bills on a timely basis; (Charter of Governance, 2012)

2. The government's failure to aggressively pursue wider uses of alternative sources of energy, be they solar or wind power, or other increasingly realistic options. This failure has been particularly disastrous because over the past five years there were periods when 25% of all of the country's foreign earnings had to be used to pay the bill for imported fuels. This is not only a major drain on the overall economy but leaves the country extremely exposed to significant devastation from the increases in the price of oil. (Charter of Governance, 2012)

3. Presently, The Bahamas is a food deficit country, which mean that they import more food than they produce locally. Since 2007, their food import bill has exceeded half a billion dollars and continues to climb. At the present rate, by 2017 food imports will reach the billion-dollar mark. The Progressive Liberal Party is aware that this high import bill has serious implications for the Bahamas. This scenario impacts on the foreign exchange reserves, endangers the environment and the safety of the food chain, while also contributing to a decline in the economy by eliminating employment opportunities in the farming community. Furthermore, agribusiness development and diversification of the sector have been stifled. (Charter of Governance, 2012)

4. For the past two decades, there has been virtually no public sector investment in infrastructural upgrade, manpower development and public/private sector partnership of food production in The Bahamas. This has resulted in substantial decline of agricultural products in The Bahamas; for example, the number of acres under cultivation suffered an almost 25% fall from 50,429 in 1994 to 37,902 acres in 2010 and the number of farmers fell from by more than 28% from 1727 in 1994 to 1242 in 2005. (Charter of Governance, 2012)

The Charter of Governance discusses the energy deficit, frequent black-outs and need for alternatives. Yet, to date, four years after the Charter of Governance was brought to the people of the Bahas there has been no policy change, no legislative change and not renewable energy projects initiated. At this time it would appear that the Charter of Governance of 2012 is but political posturing and rhetoric, failing to satisfy Research Question # 1.

2.2 The Bahamas New Strategies to Reduce Demand

The Government Charter of Governance also introduced incentives to reduce the demand for energy by measures such as increased uses of solar and wind energy, tank-less heaters, the most energy efficient systems for air conditioning.

This group of initiatives include the retro-fitting of Government buildings for wider use of solar power. The converting of street lights to LED fixtures to greatly improve visibility and reduce Costs to the Government. They are also encouraging businesses to conduct independent energy audits, whose cost would be deductible from the revenues that form the basis on which the business must pay its business license fees for the year the audit is carried out. (Charter of Governance, 2012) Yet, to date there has been no retro-fitting of Government buildings and no LED street lights installed. Research Questions $ 1, # 3 nor # 4 were satisfied in the positive.

2.3 Increasing Bahamas Electric Corporation Efficiency

From my personal experience with living in the Bahamas, the level of ineffective management at BEC has gotten so inefficient that the power company has to rent power plants in an effort to keep up with demand. Obviously, this is as a result of poor planning and not staying in touch with the realities of the country's economic strategy.

In the Charter of Governance 2012, the Government has mandated a dual strategy to be implemented to improve efficiency at BEC. First, they are freeing the Corporation from the present degree of partisan political interference in its day-to-day management. They will end the practice of having two cabinet ministers who share responsibility for the BEC. Secondly, they will encourage private sector electricity generation that can be sold to BEC. (Charter of Governance, 2012) To date, there has been no legislative change to allow private sector

generation of power. Quite the contrary, the old law that restricts private generation of power to 250 kilowatts is still in place. Companies such as Coke who may wish to generate their own power are restricted from doing so under the current law. This lack of accommodation for private sector generation such as the manufacturing of Coke is evidence that the Bahamas is not transforming its energy sector, as suggested by Research Question # 3.

The current practice in the Bahamas is for each island to create and maintain an independent power plant for its own consumption purposes. This is not necessarily the most efficient means of producing power to meet the needs of every community. In its Charter of Governance, the government will conduct a national review plan to evaluate the economic viability of moving power from one island to another from a larger and more efficient power plant. (Charter of Governance, 2012) The sun hours in the Bahamas are very attractive for the creation of solar energy. The future may witness a reversal in energy production and consumption, where the Bahamas becomes a source of exported energy for Florida. Imagine the Out Islands closest to the Florida shores producing and selling solar energy to Florida. This possible now with the efficiencies and cost of solar technology.

Members of the Bahamas Chamber of Commerce at luncheon during which the Minister of the Environment and Housing the Hon. Kenred Dorsett addressed the topic: "Energy Sector Reform in The Bahamas". The event was held Wednesday, September 11, 2013 at the British Colonial Hilton.

2.4 Advancements in Technology can Propel the Bahamas

Advancements in technology can be used to create green areas of agricultural production from coral-based fields. Concentrated Solar Power has developed to such an extent that a simple interface will replace the water-thirsty cooling towers of a typical plant with a saltwater cooling system that utilizes greenhouse roofs to dissipate the waste heat from the concentrated solar power process. The heat from the solar mirrors will be used to drive a multistage evaporative desalination system for production of distilled water for the plants in the greenhouse and outside. The waste heat is used to warm the greenhouses in the winter and to regenerate the desiccant used for dehumidifying the air.

This innovation can represent the first fully operational 24 hour solar unit in the Caribbean. It will be used to measure the performance of solar collectors in Freeport, Grand
Bahama conditions, providing vital information for future larger scale solar power facilities. So too will the Project provide the first testing ground to examine the impacts of co-locating solar collectors with re-vegetated areas, in which plants and humidifying salt gardens can reduce the dust levels that can reduce the performance of solar energy systems, and partially protect the valuable mirrors from harsh coral-based winds. (Solar Bancorp, 2014)

Saltwater-cooled greenhouses will provide suitable growing conditions that enable year-round cultivation of high-value vegetable crops in the sparse Freeport, Grand Bahama coral-based land. The greenhouse-structure will consist of 3 – 5 bays that will compare the performance of ETFE (a polymer called Ethylene tetrafluoroethylene) and polythene roof coverings on the horticultural yield. The cooling system will be an evaporative cooler at one end of the greenhouse. The cool air will be supplied under the plants via polythene ducts to ensure that the cool air is distributed evenly along the greenhouse and at low level. As the air heats up it rises

and is expelled via high level openings in the end wall.

The middle bay will have a twin skin ETFE membrane roof that forms a void over the greenhouse. This is linked to an evaporator pad and fan that can use the waste heat from the Lucayan technology to evaporate seawater or regenerate the desiccant and produce hot moist air.

When the air is passed through the void at night it will cool and the moisture in the air will condense out to give fresh water that can be used for irrigation of the plants. By using saltwater to provide evaporative cooling and humidification, the crops' water requirements are minimized and yields maximized with a minimal carbon footprint.

At the rate that population is growing, that by 2050 over 9 billion people will share our planet. Today the Bahamas and Small Island States are facing intertwined challenges of food, water and energy security, coupled with climate change, and coral-based classification and shrinking forests. None of these challenges are without solutions. At the same time it is ever more clear t that we cannot afford to pursue responses to one challenge that come at the expense of another. The greatest challenges of our time are closely interlinked and the same must be true for their answers.

As a reaction to the extractive use of resources that has contributed to the loss of natural vegetation, the Lucayan Project proposes to use sustainable practices to establish vegetation in coral-based arid areas and reverse the trend of coral-based classification. This process of restorative growth will be catalyzed by combining already existing and proven environmental technologies, such as the evaporation of saltwater to create cooling and distilled fresh water (i.e. in a saltwater-cooled greenhouse) and solar thermal energy technologies. The technological

combination is designed to utilize what we have enough of to produce what we need more of, using coral-based land, saltwater and CO2 to produce food, freshwater and energy.

The Lucayan Project proposes to establish groups of interconnected economic activities in different low lying coral-based areas in the Bahamas, which can then be used around the world. The simple core of the concept is an infrastructure for bringing saltwater inland. The saltwater is used to condition the air in a greenhouse to create ideal growing conditions for the crops inside. Evaporation of the saltwater at the greenhouse entrance cools and humidifies the dry Bahamian air, creating conditions in the greenhouse that significantly reduce the irrigation requirements of the high value plants grown inside. Some of the water vapor in the greenhouse air will condense on cold surfaces, such as the roof, at night to contribute freshwater for irrigation of the crops. The saltwater will also be evaporated over outdoor evaporative structures, called "Lucayan gardens", to create external spaces with sheltered and humid conditions, aiding re-vegetation of the environment outside the greenhouses.

The saltwater-cooled greenhouse infrastructure is combined with Photovoltaic and/or Concentrated Solar Power electricity generation facilities. The systems use mirrors to concentrate the energy from the sun to create very high temperatures, which produce superheated steam that can power a conventional steam turbine. By combining the solar system facilities with a saltwater infrastructure, highly beneficial synergies are achieved. Not only will the saltwater be used for cooling in order to achieve cost-efficiently increase power production, but the surrounding facilities and vegetation will also ensure that more sun reaches the mirrors and less dust settles on the reflecting surfaces.

The waste heat from the concentrated solar facility will be used to evaporate yet more saltwater for distillation into freshwater, and to provide heating to the greenhouses

during cold nights. By establishing a commercially viable way to bring saltwater into the coral-based Project so that saltwater works as an enabling technology, the Project will create opportunities for a wide variety of businesses to develop alongside it.

In the Bahamas, future greenhouses utilizing seawater to provide cool and humid growing conditions for vegetables can exist. The greenhouses can also produce freshwater themselves. The greenhouses can be coupled with a state of the art parabolic trough solar collectors with a thermal desalination unit supported by PV-technology. These systems can allow for the cultivation of algae in a system of photo-bioreactors and open pond cultivation systems.

An important component of the success of the Nexus in the Bahamas is to demonstrate the potential for cultivating coral based land and making it green. Through modern technology innovation outdoor vertical evaporators can create sheltered and humid environments for cultivation of plants. Additionally, even a coral based system can contain hydroponic raceways for cultivation of halophytes, which are plants tolerant of irrigation with salty water, as well as raceways for fish and shrimp production. The facilities will be supported by on-site laboratories, scientists and professional growers. Technology now exists to grow food in a coral-based environment. Research Questions # 2 relative to transforming water and energy sectors, is addressed by the Lucayan Project, though within the private sector.

2.5 Saltwater Algae Innovations

It is possible to create an agricultural industry to assist in the self-reliance of food products within a coral based geography such as the Bahamas.

Saltwater algae cultivation is one of the most promising future pathways to large-scale bioenergy production, and has key natural synergies with the rest of the Lucayan Project concept. Profitably

securing an adequate saltwater supply is a major hurdle for many algae facilities. In the Lucayan Project, not only can an algae facility use the same saltwater infrastructure, it can use the same saltwater. Much of the outflow from an algae facility is still at salinities of only 5 or 6 %, such that it can be reused in the greenhouses, for Lucayan systems cooling, and throughout the rest of the Lucayan system.

In contrast to most traditional desalinization practices, the Lucayan Project operates without emissions of brine back to the sea. As the water is evaporated from saltwater the salinity increases to the point that the salts precipitate out from the brine. The extraction of the minerals from saltwater is a sustainable alternative to mining salt. The largest component is table salt, which has many uses in food preparation, road maintenance, and as an industrial feedstock. This project is not by way of Government initiative, but rather by a private sector initiative. On Grand Bahama Island there are currently no renewable energy project initiated by the Government. Research Question # 1 does not yield a positive answer for the Grand Bahama Island. There is no evidence of current fundamental solutions in place to sustain the Nexus in Freeport, Grand Bahama.

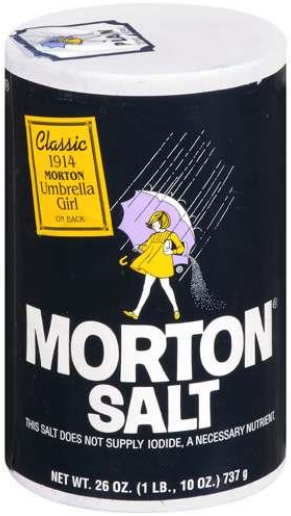
2.6 Inagua Salt Mining – Morton Salt

The Bahamas has salt mining still in existence, as seen on the two islands of the Inaguas. The most southerly and the third-largest island of The Bahamas, Great Inagua, some 40 miles long and 20 miles wide, is home to 1,200 people. It lies 325 miles southeast of Nassau. There are two separate islands, Great and Little Inagua, which together are referred to as the Inaguas.

Nearly a million pounds of salt is produced from the Salinas of Inagua by the Morton Salt Company. The process of producing sustainable salt is another fascinating testament to how

resourceful and ingenious man, combined with nature, can be in a sustainable manner. Sea water is pumped into the interior of the island and held in dikes. There are 80 salt ponds, covering over 12,000 acres. (Morton, 2015) As the water evaporates, it turns into heavy brine. A continual process of the salt solidifying at night and melting during the heat of the day, forms a crystallized bed at the bottom of the pond. In the final stage, any remaining water is drained and the salt is bulldozed into bleached white mountains and shipped around the world for processing.

Morton Salt is acutely aware of the impact that their extraction methods may have on the Bahamas environment. This 160 year old company recognizes that they require products from the Earth. In their website they state that they are committed to minimizing the impact of their business on the environment. Setting good standards for other companies to duplicate, they have recently completed an energy reduction project at one of our largest manufacturing facilities that resulted in dramatic energy reductions in our evaporative process. This project resulted in Morton reducing energy consumption by over 70% within the process, including a 90% reduction in natural gas usage. This reduction in direct greenhouse gas emissions from the facility is the equivalent of keeping over 4,000 cars off the road. (Morton Salt website) They have installed solar technology which eliminates the use of outside power at some of their locations. They have also joined forces with a company that plants trees to offset 100% of the carbon dioxide emitted in the paperboard production process. This effort alone is saving on average the equivalent of 50,000 trees per year, and keeping over 3 million pounds of waste out of landfills. (Morton Salt website) The Morton Salt company is demonstrating Nexus principles, and does respond favorably to our Research Questions # 1, # 2 and # 3. It is transforming its energy production and consumption.



(Morton, 2015)

The world's largest colonies of flamingoes call Inagua their home, numbering in excess of 60,000, who love the lagoons created by the Morton Salt Company. They feed primarily on tiny aquatic invertebrates like brine shrimp, which thrive in the salt lagoons because they don't have much seaweed or vegetation in them. The flamingos help out the salt company in a sustainable manner, by keeping the evaporation ponds relatively free of algae and other impurities. And the salt company helps out the flamingos by adding brine shrimp to the lagoons. This is called a mutually beneficial relationship. (Bahamas Gateway, 2014) Morton Salt is an example of how a Bahamas based company can work within a sustainable model, balancing nature's needs with the need to produce salt from the sea.

2.8 Bahamas Signs Deal to Upgrade its Water and Sewage Facilities

On Monday February 23, 2009 the Water and Sewage Corporation (WSC) of the Bahamas signed a deal for $83 million to reduce water and sewer leaks. The deal was signed with the corporation Miya/Veritec to reduce the substantial leakage from its distribution system.

The contract was successful as a result of a $81 million loan agreement signed on December 16,

2011, between the WSC and the Inter-American Development Bank (IDB). In the news article it was noted that the loan was made possible to assist the Water Sewage Corporation to achieve financial and operational sustainability. (Tribune, 2009)

The upgrade strategy focuses on New Providence and tackle four major areas of concern:

1. The reduction of lost water, known as non-revenue water (NRW) leakage
2. Rehabilitation of existing water systems
3. Upgrade of waste water infrastructure in Nassau
4. Preparation of a Waste Water Treatment Plan in Nassau

They were experiencing losses of over five million gallons of the water it supplies daily in New Providence. This is equivalent to over 50 per cent in losses and is valued at nearly $16 million annually. (Tribune, 2009)

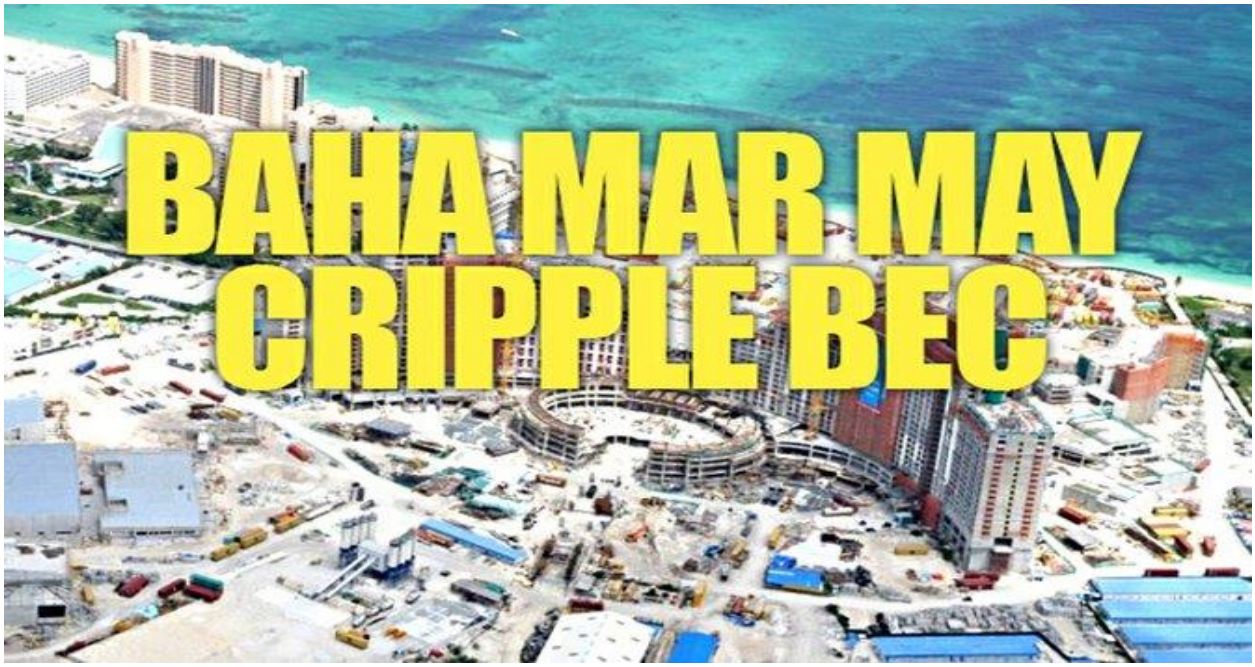
The second phase of the project requires the reduction of losses continue to reduce NRW further to 2.0 million gallons per day in year seven. During the 10 year period, over 10 billion gallons are expected to be saved. (Tribune, 2009) This initiative illustrates that the Bahamas is aggressively revitalizing their water infrastructure, adding positive review to Research Question #3. This is evidence that the Bahamas is transforming the water sector.

Plagued by frequent daily power outages the Bahamians have reached a point where they demand reform of their electricity generation. Daily outages are not infrequent. With the recent construction of the largest resort in the Caribbean, called Bahamar, planned to open in mid-2015, the power shortages in Nassau will mount. Bahamar will feature 2,200 hotel rooms, 50 and shops, 284 private residences, 200,000 square feet of convention space, and casinos. In a country that cannot guarantee uninterrupted continuous power to its residents, how can this mega project proceed successfully without an upgrade to its power generation? (Miami Herald, 2015)

Bahamar Resort, to open in mid-2015. (Travel Weekly, 2015)

2.9 Nexus Role in Bahamar not Opening on Time

The behemoth, $3.5 billion Baha Mar resort in the Bahamas delayed its opening twice in six months. The property, claiming to be the largest resort project in the Western Hemisphere, comprises 2,200 rooms, four hotel brands, 40 restaurants and bars. A club designed by Lenny Kravitz, and a golf course designed by Jack Nicklaus, this megaresort has been plagued by construction delays, even though 4,000 Chinese workers have been laboring around the clock. The soft opening in February shut down power to Nassau for three days. Bahamar is a good example how planning for Nexus considerations are very important when designing a resort, or any business venture. There is not enough power to generate the needs of Bahamar. There is not enough water in Nassau to provide to Bahamar. All of the food for Bahamar must be imported from off-island. It is reported that at least $200 million must be spent to upgrade Bahamas Electrical Corporation in order to fuel Bahamar's power needs. (Tribune News, 2014)



(Tribune News, 2014)

The Chairman of BEC Mr Albert Miller recently reported to the Tribune News the following statement, acknowledging the power deficit in Nassau: "We need a new plant with sufficient reserves, that is what we are faced with right now. It will be a big problem if we don't get this plant. If one of those engines goes down when Baha Mar comes online, it will cause serious problems. We anticipated this and tried to move fast. We are just waiting for those who make the decisions to make a move. If everything is percolating and working as it should, we will be fine, but if an engine trips it will present problems," he said. (Tribune News, 2014) Chairman Miller of Bahamar and the Government have known about Bahamar coming on stream for five years, the length of time it has been under construction. Yet, BEC has not build any new power generation to accommodate this huge draw on their power resources. Considering the lack of power available to Bahamar, it would appear that Research Questions # 1, #3, and # 4 have failed to gain a positive result.

The energy challenges in the Bahamas appear to be front and centre on the mind of the Minister

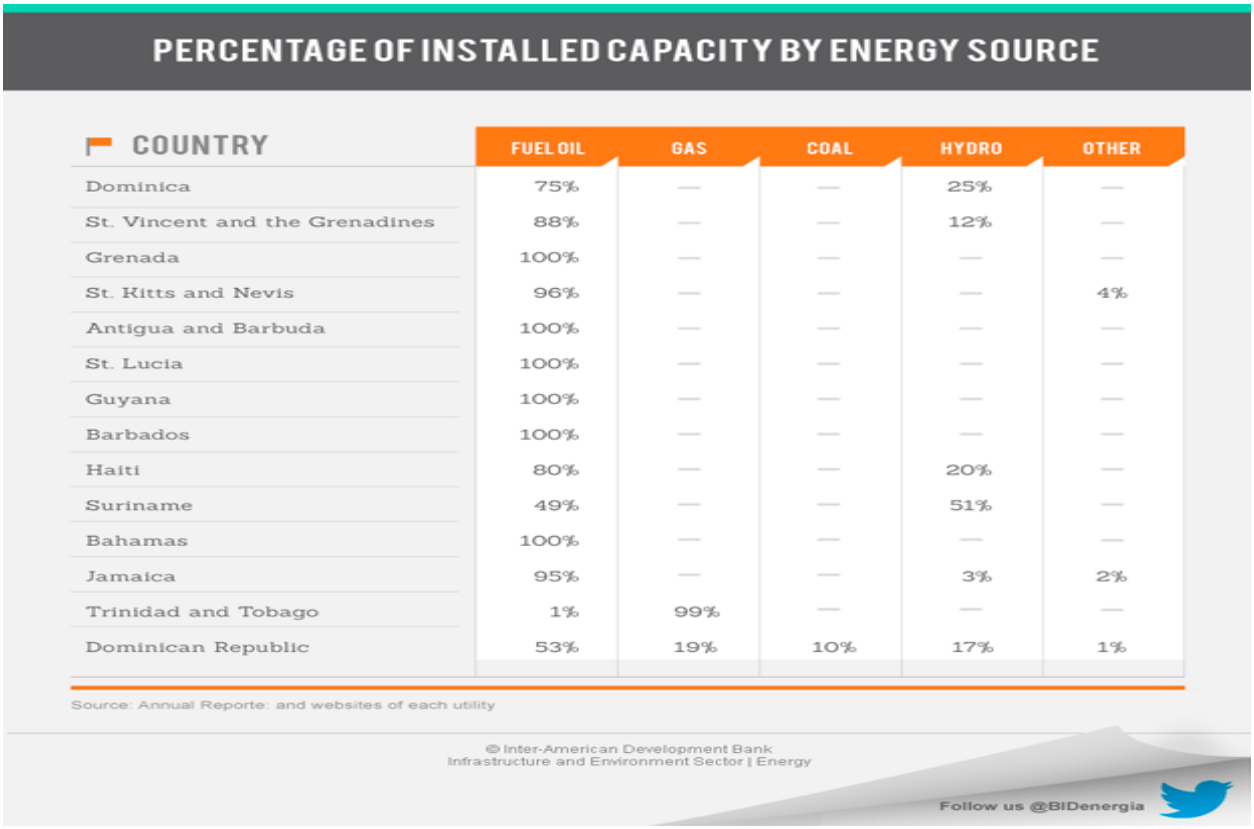
of Housing the Honourable Kenred Dorsett. Addressing the Bahamas Chamber of Commerce, Minister Dorsett outlined a comprehensive plan aimed at reforming the energy sector and delivering more affordable electricity to consumers.

He was addressing the topic: Energy Sector Reform in The Bahamas during the Bahamas Chamber of Commerce Luncheon on Wednesday, September 11, 2013 at the British Colonial Hilton.

Minister. Dorsett outlined plans, policies and possible new legislation aimed at revamping the country's energy sector, particularly as it relates to the Bahamas Electricity Corporation, (BEC), the operational costs for investors and commercial entities and the heavy economic impact on Bahamian families. During his deliberation to the Chamber of Commerce, he stated: "The cost of electricity in the Bahamas has become a problem that we cannot allow to continue to increase while expecting growth within the economy of this country. The two can no longer co-exist," he said. (Government of Bahamas, 2013)

In this vein, the government has sought to reduce operational costs at BEC by improving on operational efficiencies and reducing waste wherever possible. An Energy Task Force was established and charged with advising the government on solutions to reducing the high cost of electricity.

"We eliminated the excise tax on fuel used by BEC in the 2013-2014 Budget, which was forecasted to reduce energy cost by six percent. We also eliminated tariffs on inverters for solar panels and LED appliances to ensure that more of our citizens would be able to afford these energy saving devices," he said. (Government of Bahamas, 2013)



PERCENTAGE OF INSTALLED CAPACITY BY ENERGY SOURCE

COUNTRY	FUEL OIL	GAS	COAL	HYDRO	OTHER
Dominica	75%	—	—	25%	—
St. Vincent and the Grenadines	88%	—	—	12%	—
Grenada	100%	—	—	—	—
St. Kitts and Nevis	96%	—	—	—	4%
Antigua and Barbuda	100%	—	—	—	—
St. Lucia	100%	—	—	—	—
Guyana	100%	—	—	—	—
Barbados	100%	—	—	—	—
Haiti	80%	—	—	20%	—
Suriname	49%	—	—	51%	—
Bahamas	100%	—	—	—	—
Jamaica	95%	—	—	3%	2%
Trinidad and Tobago	1%	99%	—	—	—
Dominican Republic	53%	19%	10%	17%	1%

Source: Annual Reporte: and websites of each utility

(Inter-American Development Bank)

The chart above illustrates that 100% of the Bahamas Installed Energy Capacity is sourced from Fuel Oil. (Inter-American Development Bank). It is not a coincidence that the mounting fiscal imbalances in the Bahamas as well as other Caribbean nations with the reality of paying the world's highest energy costs per capita. The 100% dependency on imported fossil fuels as illustrated above places heavy pressure on the Bahamas economy. The focus now is on best defining the Bahamas Energy Corporation's future role in the Bahamas.

Another savings measure is to create two new BEC entities into which the relevant assets, liabilities and operations of the corporation will be transferred. The first, a new Transmission and Distribution Company (NewCo), which will be wholly owned by BEC. This company will be responsible for the operation, maintenance, repair and expansion of Newcos electricity

transmission and distribution systems and for billing, collection, customer services and other relevant services across The Bahamas. To-date, this transformation of BEC has not happened, suggesting that Research Questions #1, # 3, and # 4 are not being satisfied in the positive.

The second company will be a new Generation Service Company, which will be responsible for the operation, maintenance, repair, financing of BEC's current electricity generation facilities and certain other assets located across The Bahamas, as well as the development of new power generation plant. It will enter into a Power Purchase Agreement with NewCo.

"We are seeking a partner to manage the operations of NewCo, bringing state of the art business practices, processes and technology to the Transmission Distribution Systems," Mr. Dorsett said. (Government of Bahamas, 2013)

The government expects to have clear cost reduction targets and incentives, as well as performance benchmarks embedded into the contract.

The performance benchmarks will address issues such as network reliability, average outage periods, frequency of outages, system losses, speed of restoration of power, speed of connections, billing punctuality and a number of other issues consumers currently suffer from. These initiatives will be underpinned not only by robust contracts with the preferred bidder or bidders, but also by a new regulatory regime, which, amongst other benefits, will bring direct and independent oversight of the cost of electricity.

3.0 Bahamas Eco-Forum and the Future of Bahamas Electric Corporation

An Information Exchange and Idea Factory for Sustainable Living was held on August 28, 2013, called the Bahamas Eco-Forum.

During the Eco-Forum it was learned that the Government wishes to split the state-owned Bahamas Electricity Corporation into two separate companies by the end of this year, and has

invited private sector management bids, as mentioned above. (Bahamas Eco-Forum, 2013) After two years this proposal has not yet happened, to the chagrin of the citizens.

The proposal is similar to the current situation in Trinidad and Tobago, where a state-owned utility retails electricity via a single interconnected grid, while a privatised joint venture company produces the electricity. Trinidad's state-owned utility divested its generation assets in 1994 to a public-private partnership called PowerGen. The shareholders of PowerGen include the state utility, Maru Energy of Georgia and Amoco of Texas. (Bahamas Eco-Forum, 2013) The proposal prompted a response from former BEC chairman Michael Moss, who said unbundling the corporation's assets was not a good idea. "Power plants account for about 80 per cent of BEC's total operating cost," Moss said, "with transmission, distribution and customer service accounting for the remaining 20 per cent." (Bahamas Eco-Forum, 2013) Separating generation from transmission, distribution and customer service will likely lead to increased cost to consumers, as there will inevitably be a duplication of administrative and other overhead costs in the two organisations. (Bahamas Eco-Forum, 2013). Moss also stated that the number of small Family Island plants operated by BEC, some with as few as two or three employees, posed another problem. "How do you split generation from transmission, distribution and customer service at such locations? Not only will there be an increase in administrative overheads with two separate entities, there will likely have to be an increase in the number of employees." (Bahamas Eco-Forum, 2013) He said the government should privatise BEC as a single entity to exist economies of scale, and noted that the Trinidad model had proven less successful than models which kept the original company intact.

Under this scenario, the most likely player is Genting Group, the Malaysian multinational which has announced several investments in the Bahamas tourism industry since Christie and his

Progressive Liberal Party were returned to office in May 2012. (Bahamas Eco-Forum, 2013) Genting's Oil and Gas Division is both a production and exploration company, and the Bahamas is about to embark on exploratory oil drilling in offshore waters. Genting also generates power in Malaysia, China and India. (Bahamas Eco-Forum, 2013)

Genting provided the government with a report on energy and cost reduction at the end of last year, and this past May Christie was said to be in "high-level talks" with Genting in New York involving energy and resort investments in the Bahamas. But the Prime Minister has insisted his administration did not have any specific candidate in mind to take over BEC. He said he was pushing to seal the deal by the end of the year purely in response to complaints about the country's high electricity rates. (Bahamas Eco-Forum, 2013) The end of the year has come and went, yet no deal to privatize BEC. 2014 nor 2015 has seen a deal come to fruition for the reorganization of BEC. Research Questions # 1, # 3, nor # 4 are addressed in the positive.

There had been no public discussion of restructuring BEC until the Prime Minister's surprise statement in mid-August, 2013. A Request for Proposal was subsequently issued, which outlined "the intent of the government to create two new companies into which relevant assets, liabilities and operations of the Bahamas Electricity Corporation will be transferred...to achieve cost and operational efficiencies." (Bahamas Eco-Forum, 2013)

"We are inviting (applicants) to bid on the management of BEC, similar to the Nassau Airport Development Company," Prime Minister Christie said. "You simply come in and manage BEC, or a private company becomes responsible for the generation of electricity at BEC and the management and distribution of it." (Bahamas Eco-Forum, 2013) Bids have come in to BEC, yet there has been no selection of developer to date. Research Question #3 is not satisfied that

the Bahamas is serious about transforming its energy sector, though there is no lack of political posturing.

Nassau Airport Development Company is owned by the government and currently managed by a Canadian firm called Vantage Airport Group under a 10-year contract. In 2007, NAD signed a 30-year lease with the government to manage and operate Lynden Pindling International Airport. Christie said the government's objective is to "create efficiencies which will allow for significant reductions in the cost of energy, increased energy security, environmental responsibility, reliability, and increased competitiveness as a country." (Bahamas Eco-Forum, 2013)

He said there would be no job losses as a result of this process, adding that any agreement would include significant investments in new technology training for Bahamians. He also said that "liberalisation" of the energy sector could be expected to create new business opportunities for Bahamians. (Bahamas Eco-Forum, 2013) But union leaders reacted negatively, saying they had not been consulted over the restructuring proposals. Union leader Clinton Minnis said BEC employees were concerned over their jobs and unsure of what the proposals would mean for consumers "as the government is carrying a lot of the electricity costs now." (Bahamas Eco-Forum, 2013)

3.1 Bahamas Economy - Bahamas Requiring $1bn in Short-Term Infrastructure

On September 24, 2013, Simon Townsend a senior partner and managing director with KPMG Bahamas stated that the country will likely need $1 billion in short-term infrastructure investment, and that the energy sector was an absolute priority. (Tribune, 2013)

In an interview with Tribune Business at the 2013 KPMG Island Infrastructure Summit, Mr Townsend added that the cost of energy was key to this nation's economic development.

"An absolute priority right now is the energy sector. That's a big area. Investment in that sector

is very important. Managing it in the right way with private expertise is also important," said Mr Townsend. (Tribune, 2013)

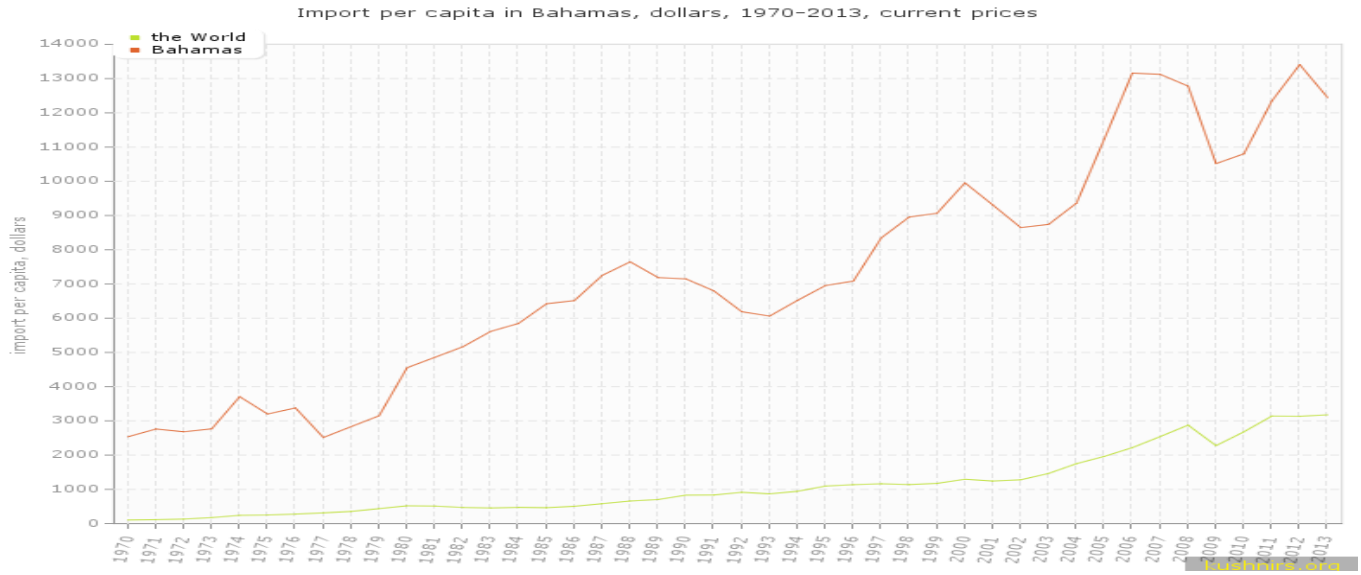
KPMG has been hired by the Government to managed its tender process as it seeks to reform the Bahamas Electricity Corporation (BEC). Mr Townsend recently told Tribune Business that the Government had ultimately received nine proposals to take over operations at the country's major electricity supplier.

The Bahamas relies on tourism to generate most of its economic activity. Tourism as an industry not only accounts for over 60 percent of the Bahamian GDP, but provides jobs for more than half the country's workforce. After tourism, the next most important economic sector is financial services, accounting for some 15 percent of GDP. This very high concentration of only two industries comprising over 75% of the Bahamas' economy is very precarious.

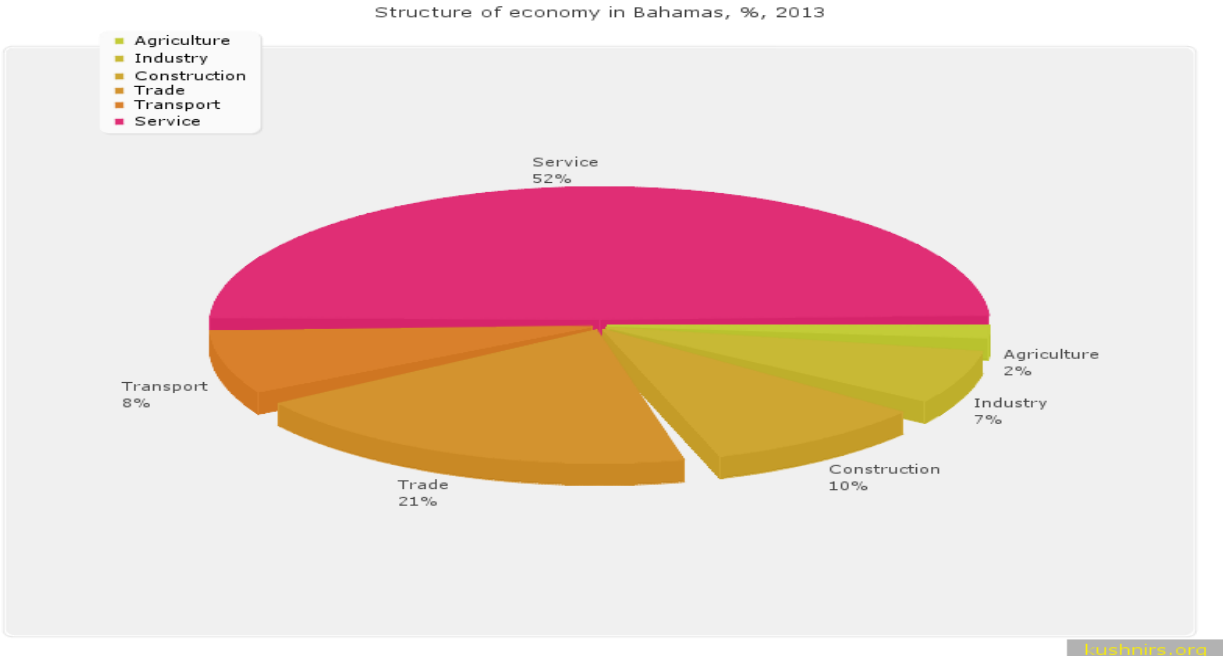
It is very challenging for the Government of the Bahamas to fund infrastructure Operations and Development without the advantage of personal or corporate income taxation. There are no taxes levied on persons nor companies. Therefore government revenues are not based on personal or corporate earnings, but rather based on import stamp taxation. When imports drop, so does the revenue base of the government.

As the following graph describes, the Bahamas imports a disproportionate percentage of its economy compared the world trends.

Bahamas Imports per Capita versus the World Import Trends



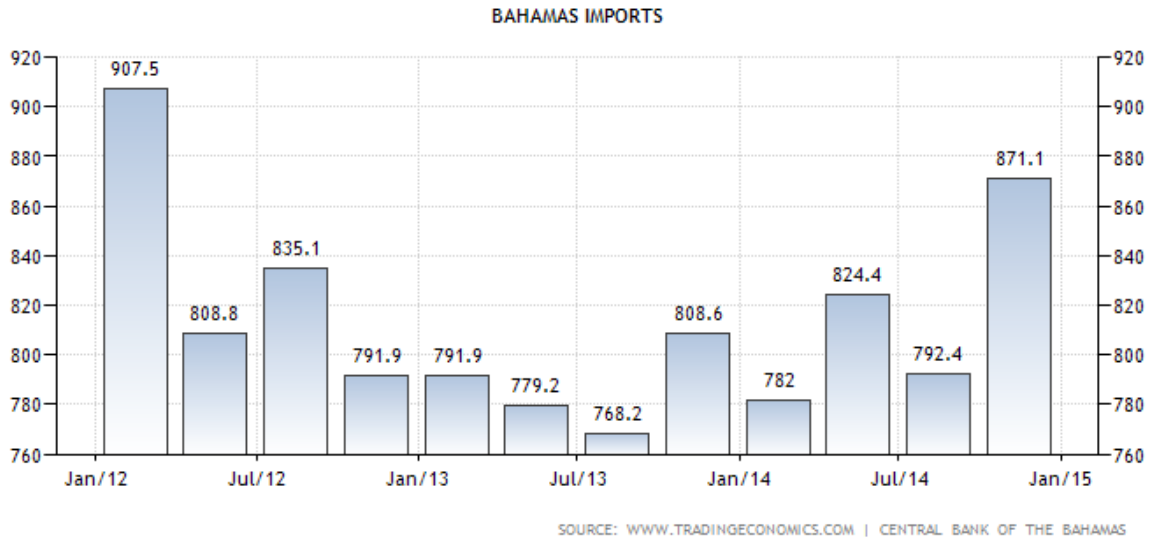
As this chart above illustrates, imports far an exceed the world trends of imports, producing a widening balance of payment deficit. The chart right below illustrates the disproportionate majority of the economy focused on the service sector, over 50%.



(Macroeconomics in the Bahamas)

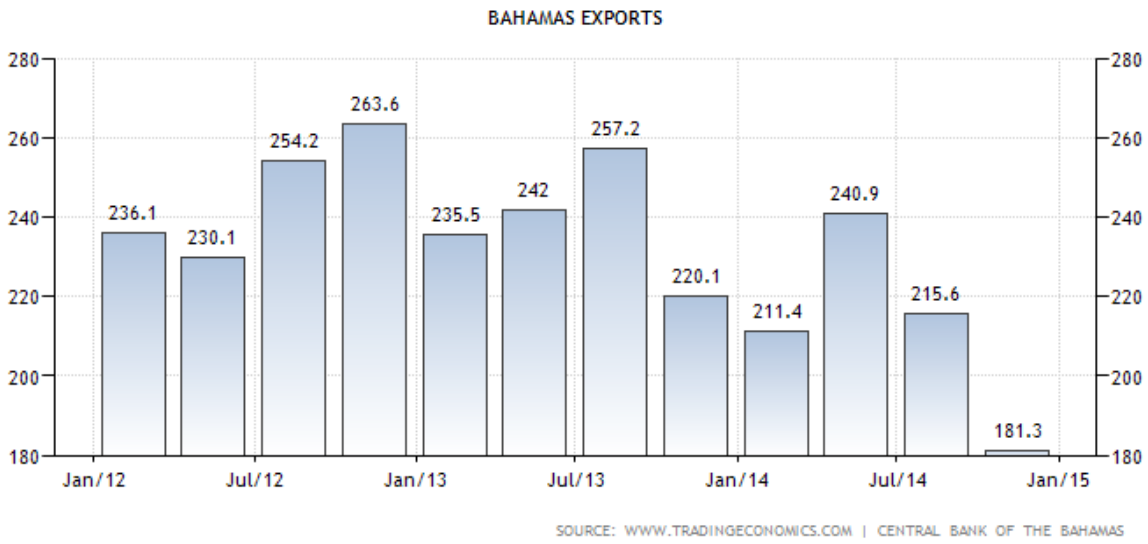
3.2 Bahamas Imports 2002-2015

The economics of the Bahamas is disproportionately unbalanced in favour of imports. Imports in Bahamas increased to 871.10 Million Bahamian Dollars in the fourth quarter of 2014 from 792.40 Million Bahamian Dollars in the third quarter of 2014. Imports in Bahamas averaged 667.35 Million Bahamian Dollars from 2002 until 2014, reaching an all-time high of 907.50 Million Bahamian Dollars in the first quarter of 2012 and a record low of 373.30 Million Bahamian Dollars in the third quarter of 2002. Imports in Bahamas is reported by the Central Bank of The Bahamas. (Trading Economics)



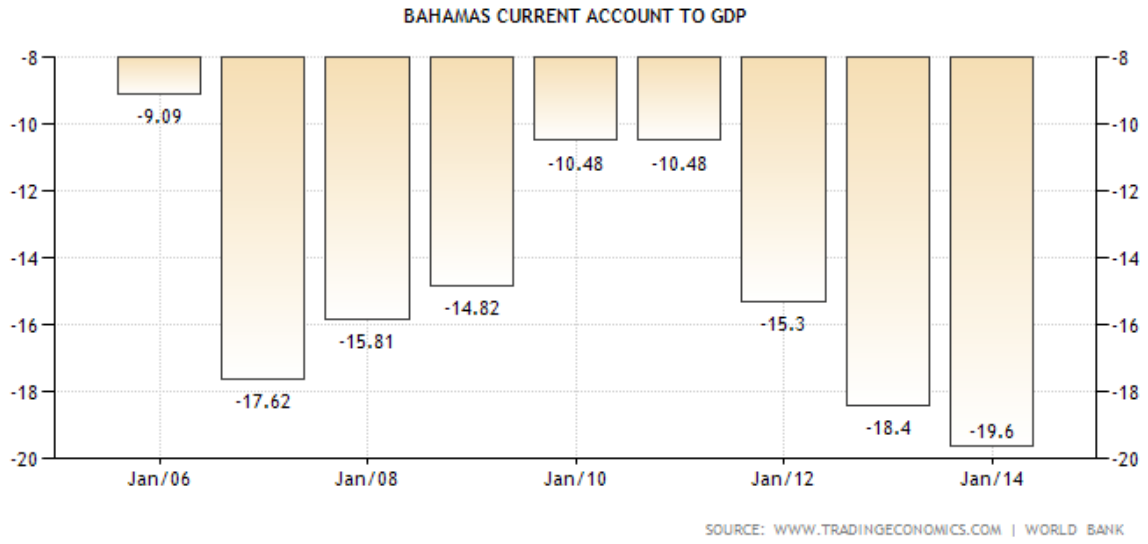
3.3 Bahamas Exports 2002-2015

Exports in Bahamas decreased to 181.30 Million Bahamian Dollars in the fourth quarter of 2014 from 215.60 Million Bahamian Dollars in the third quarter of 2014. Exports in Bahamas averaged 180.55 Million Bahamian Dollars from 2002 until 2014, reaching an all-time high of 263.60 Million Bahamian Dollars in the fourth quarter of 2012 and a record low of 90 Million Bahamian Dollars in the second quarter of 2003. Exports in Bahamas is reported by the Central Bank of The Bahamas. (Trading Economics)



3.4 Bahamas Current Account to GDP 1976-2015

Bahamas recorded a Current Account deficit of 19.60 percent of the country's Gross Domestic Product in 2013. Current Account to GDP in Bahamas averaged -6.52 Percent from 1976 until 2013, reaching an all-time high of 10.61 Percent in 1976 and a record low of -19.60 Percent in 2013. Current Account to GDP in Bahamas is reported by the World Bank. (World Bank)



(World Bank)

3.5 Bahamas Produces 'Only 10 Per Cent Of What It Consumes'

Minister of Agriculture V Alfred Gray

Addressing the Inter-American Institute for Cooperation on Agriculture, The Bahamas Agriculture Minister V. Alfred Gray stated that the Bahamas produces only 10 per cent of what it consumes. One of the main challenges for his country was trying to show that agriculture was an attractive profession and lifestyle for a new generation. (Tribune, 2013)

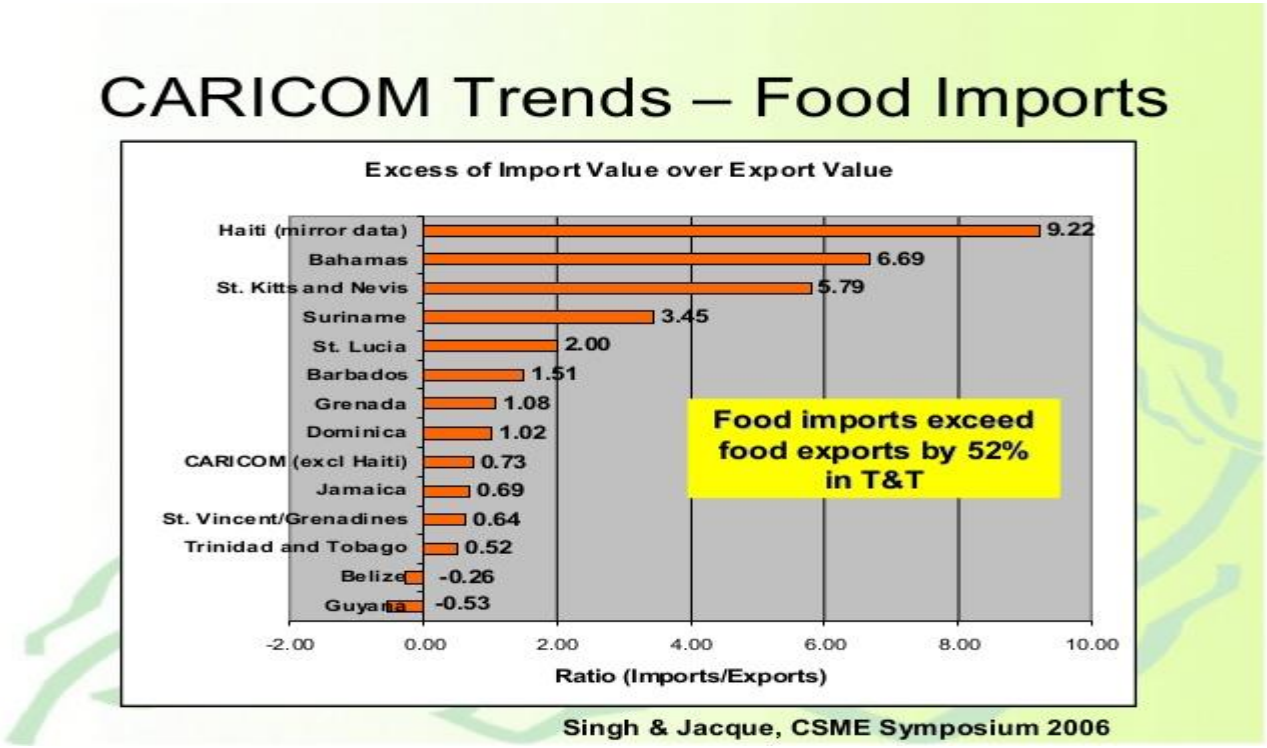
"We do not have a developed agricultural sector; we produce only 10 per cent of what we consume," he said. (Tribune, 2013) Recently, two specialists were sent to work on the modernization of the national agricultural health system, and a market information specialist. The Minister was in discussions with their organization for assistance with the equipping of a laboratory for plant, animal, and food safety analysis, as well as information on bio-energy. (Tribune, 2013)

The Director General of IICA, Victor M. Villalobos, placed the Institute's technical capabilities at Minister Gray's disposal, and informed him that regional projects were already under way related to agricultural health, agribusiness, and market information, among other topics. (Tribune, 2013)

"With respect to the improvement of food production, the objective will be to implement initiatives whose impact will be felt in the short term, and that make it possible to lower the

import bill. We have access to the international research centres, germplasm, crop improvement techniques, and other tools on which we will draw to promote agriculture in the Bahamas," Villalobos pointed out. (Tribune, 2013) This is a positive step toward better food sustainability, yet it is early stages. This could be a positive indication for Research Question #4, whereby a Government Minister is truly dedicated to the Nexus developement of his Ministry.

The need to stimulate agricultural insurance and credit, and the importance of promoting planning of the harvesting and sale of products were other points addressed by the ministers. During his visit to CATIE, the Permanent Secretary for Agriculture of the Bahamas, Anthony McKinney, highlighted the need to further promote the teaching of agricultural studies in primary and secondary schools, and to take advantage of the professional training and masters and doctoral programmes offered by international educational organisations.



3.6 Food Scarcity Risk Creates Need for Investment:

In the next 40 years, the world's population is projected to increase by 35%, from 7.1 billion to approximately 9.6 billion people. (UN.Org, 2013) According to Megan Clark, the head of Australia's national science agency, this means that "in the next 50 years, we will need to produce as much food as has been consumed over our entire human history." (ABC News, 2009) This comes as existing eating habits around the world are changing from rice and plant-based foods to meat and high-protein food sources, which demand a greater production of grains to feed livestock.

Agriculture, as an investment sector, is in its infancy. Even though agriculture accounts for 3% of global economic activity, the public markets are severely under-developed. In addition, the sector has recently been out-of-favor; so many investors are ignoring or overlooking the longer term potential. (World Bank, 2014) The future holds for more people in the Bahamas with less arable land available.

As a backdrop to any discussion, consider that the world is trying to feed more people with less arable land per capita. This issue alone will require major innovation in the sector. Other issues will only serve to exacerbate this challenge.

Global population is growing by 80 million people per year. This amounts to the population of Germany. With the average person eating a ton of food per year, the U.N. predicts global food production will need to increase 70% by the year 2050. (World Bank, 2014) Meanwhile, arable land is disappearing because of urbanization, water scarcity and pollution. Most arable land that is available for development is either marginally productive or very far from infrastructure and

requires large capital expenditures to bring online.

Industry experts currently offer two solutions: advancing biotechnology and applying successes we have had in the developed world to the developing world. But, of course, we have seen global opposition to the use of Genetically Modified Organisms technologies and even places already affected by food scarcity, such as certain regions of Africa, have set strict limitations to their use. There are environmental and political concerns with going into the most attractive areas for arable land.

The world is seeking to provide more resource-intensive food to more people with less water in an increasingly difficult environment. (UN Org. 2014) To meet the growing demand for higher-quality food in both developed and developing countries, new capital will be needed in the sector of agriculture over the coming years, especially in island states such as the Bahamas. With large arable islands such as Abaco, Grand Bahama, Eleuthera, and Andros, the Bahamas has the opportunity to provide food for its own population. Investors in agriculture have historically faced risks by food prices, weather patterns, and political entities around the world. Indeed, governments have long used the supply and pricing of food and water as political tools.

Caribbean Energy Security Summit 2015

(Caribbean News, 2015)

On 26 January 2015, twenty-six countries including the Bahamas, together with seven regional and international organizations, have released a joint statement in support of the transformation of the energy systems of Caribbean countries. The signatories of the statement, signed during the Caribbean Energy Security Summit, commit to pursuing comprehensive approaches to an energy transition toward "clean sustainable energy for all" and reforms that support the creation of favorable policy and regulatory environments for sustainable energy.

The Summit, which was co-hosted by the US Department of State, the Council of the Americas and the Atlantic Council, brought together finance and private sector leaders from the US and the Caribbean, and representatives of the international community. The event showcased the initiatives under the Caribbean Energy Security Initiative (CESI) in the areas of improved governance, access to finance and donor coordination, and featured discussions by partner countries on comprehensive energy diversification strategies. (Latin America & Caribbean Regional Coverage, 2015)

This conference is of significant importance to the Bahamas because it directly associates them with all of the Caribbean countries under the one theme of energy security. Each of the Caribbean countries creates their energy from imported fossil fuels. The discussions held during this conference will reinforce the severe situation that all Caribbean islands experience. Sharing island experiences with their renewable energy solutions during conferences such as the Caribbean Energy Security Summit will only benefit the Bahamas.

Prime Minister of the Bahamas Christie Addressing the Caribbean Energy Security Summit Januay 2015

3.7 Prime Minister Christie Addresses United Nations Forum on Climate Change Summit

On September 23rd, 2014, Bahamas Prime Minister Christie addressed the United Nations Forum on Climate Change. His was a very significant step toward declaring the goals and mission of the country's climate change challenges.

During his address he stated that "…for The Bahamas, Climate Change is serious business. This threatens our very existence." (Christie, United Nations, 2014)

Prime Minister Christie went on to say: "Eighty (80) percent of my nation's land mass will be lost if the sea level rises 1.5 meters. They also say that with a warming of 3.7-4.8°C by 2100, as currently predicted, The Bahamas we know would be no more. It is with this sense of urgency

that I address you today." (Christie, United Nations, 2014)

He told the UN Forum that the Bahamas has concrete steps to reduce their carbon footprint., having adopted a National Energy Policy, which includes the introduction of renewable energy goals of at least 30% of energy generation by way of renewable technologies by 2030. He stated that they continue to focus on adaptation to climate change, despite their limited access to grant and concessional funding. They have identified the National Policy for Adaptation to Climate Change and work steadily toward implementation with civil society and other key partners. They seek to expand their marine protected area, and have established the Bahamas Protected Area Fund (BPAF); and cognizant of the possible impact of climate change on their food security they have established the Bahamas Agriculture and Marine Science Institute (BAMSI) to operate a state-of-the-art comprehensive commercial teaching farm. (Christie, United Nations, 2014)

Christie went on to say: "We have done this and more to enhance our resilience to the adverse impacts of climate change." He believes that they must look at each country's vulnerability to climate change, its debt and more importantly honor the principle that "the polluter pays". He believes that the Bahamas qualifies and expects their fair share. (Christie, United Nations, 2014)

80% of its land lies less than 1 meter above sea level. A 1 meter rise would place more than a third of major tourism properties at risk, as well as 38 percent of airports, 14 percent of road networks and 90 percent of sea ports. As inland regions around the world endure the temporary fury of intense thunderstorms and hurricanes, islands and coastal regions like the Bahamas suffer these effects and more. They see slower-burning climate phenomenon, like saltwater intrusion into the country's precious freshwater aquifers, coral reef bleaching, and beach erosion. The Bahamas owes its precarious ecological balance to its hunger for water resources. No rivers exist on the island chain; rainfall is the sole source of drinking water. Also, development has wasted

the islands' native topsoil. Food and water must be imported en masse at great expense. (International Policy Digest)

The Bahamas has very little rain during much of the year, and a significant amount of rainfall during the summer months, as is illustrated in the Climate Data Chart for Nassau below .

Climate data for Nassau [hide]													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	25.4 (77.7)	25.5 (77.9)	26.6 (79.9)	27.9 (82.2)	29.7 (85.5)	31.0 (87.8)	32.0 (89.6)	32.1 (89.8)	31.6 (88.9)	29.9 (85.8)	27.8 (82)	26.2 (79.2)	28.8 (83.9)
Daily mean °C (°F)	21.4 (70.5)	21.4 (70.5)	22.3 (72.1)	23.8 (74.8)	25.6 (78.1)	27.2 (81)	28.0 (82.4)	28.1 (82.6)	27.7 (81.9)	26.2 (79.2)	24.2 (75.6)	22.3 (72.1)	24.85 (76.73)
Average low °C (°F)	17.3 (63.1)	17.3 (63.1)	17.9 (64.2)	19.6 (67.3)	21.4 (70.5)	23.3 (73.9)	24.0 (75.2)	24.0 (75.2)	23.7 (74.7)	22.5 (72.5)	20.6 (69.1)	18.3 (64.9)	20.8 (69.5)
Precipitation mm (inches)	39.4 (1.551)	49.5 (1.949)	54.4 (2.142)	69.3 (2.728)	105.9 (4.169)	218.2 (8.591)	160.8 (6.331)	235.7 (9.28)	164.1 (6.461)	161.8 (6.37)	80.5 (3.169)	49.8 (1.961)	1,389.4 (54.701)
Avg. precipitation days	8	6	7	8	10	15	17	19	17	15	10	8	140
Mean monthly sunshine hours	220.1	220.4	257.3	276.0	269.7	231.0	272.8	266.6	213.0	223.2	222.0	213.9	2,886
Source: World Meteorological Organization (UN),[34] Hong Kong Observatory (sun only)[35]													

Average Sea Temperature

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
73 °F	73 °F	75 °F	79 °F	81 °F	82 °F	82 °F	82 °F	82 °F	81 °F	79 °F	75 °F
23 °C	23 °C	24 °C	26 °C	27 °C	28 °C	28 °C	28 °C	28 °C	27 °C	26 °C	24 °C

(Meridian Water Developments)

4.0 Bahamas Could use Family Planning

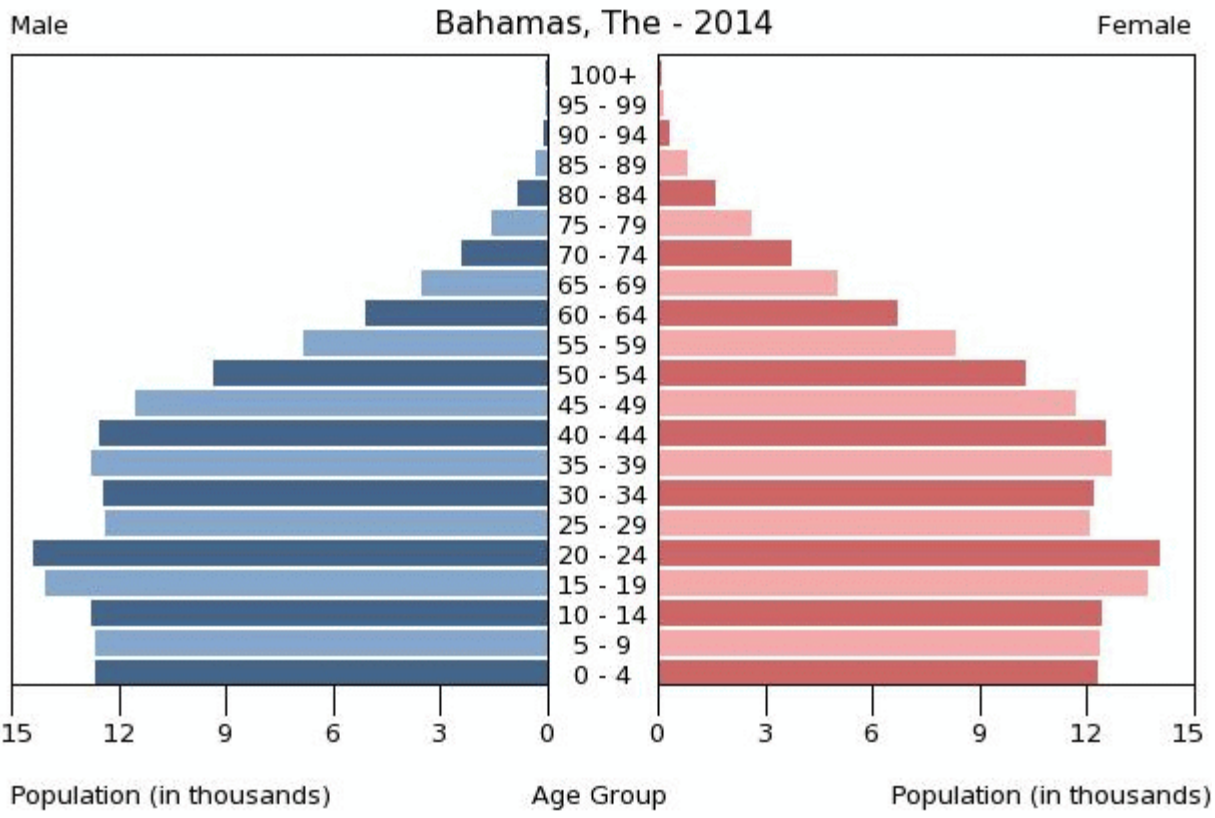
Dr Bernard Nottage

THE Bahamas today could benefit from a "good dose" of family planning at every level of society, Minister of National Security, Bernard Nottage said. Considering the percentage of children born out of wedlock, to teenage mothers, and into single-parent homes, this conclusion is obvious, Dr Nottage said. (Tribune, 2013) "Statistics produced for 2010 show that there were 13 births to children ages 10-14 years and 575 for those from 15-19 years of age," he said. (Tribune, 2013)

Dr. Nottage was addressing the Bahamas Family Planning Association and the unveiling of its new logo. During his address he mentioned that he became aware of the need for family planning more than 30 years ago. He drew a parallel between solutions to the social ills plaguing the country, many of which have a direct bearing on the extent and effectiveness of family planning initiatives.

A gynaecologist/obstetrician by profession and one of the country's earliest proponents of family planning, Dr Nottage said the ceremony made him feel optimistic and encouraged as he reflected on the struggle to effect a positive change in the attitudes of our people regarding their sexual and reproductive health and rights. (Tribune, 2013) Minister Notage demonstrates a strong dedicated Research Question #4, where his Ministry is focused on the Nexus.

He said: "My inspiration at that time was about more than delivering babies and making money. Of course there were many babies to be delivered and much money to be made. However, I wanted to see those babies grow up in secure homes, with good prospects for a happy and fulfilling family life," he said. (Tribune, 2013) "I wanted to see women enhance their education, be gainfully employed, and have their families. I wanted to deter our adolescent girls from childbirth before their bodies were fully developed and they were prepared to take on the responsibilities of motherhood." (Tribune, 2013) The general atmosphere in the country was averse to any dialogue suggesting family planning, birth control and abortion. It was simply difficult to talk about any such matters affiliated with planned-parenthood," he said. (Tribune, 2013) Dr Nottage said the association can now break new ground in services offered to young people, the economically challenged and at-risk groups, as the profile of family planning has changed considerably.



(Index Mundi, 2014)

"You must now ensure that your message gets out to those who need to hear it; that your services benefit those for whom it is intended and that the appropriate studies are carried out to ensure the effectiveness of your programmes." (Tribune, 2013)

4.1 Water Needs in the Bahamas

Currently Bahamas Energy Commission, the country's dominant utility, produces energy by burning fossil fuels, specifically diesel. How much clean water is used to generate electricity in this manner? Large quantities of water withdrawals of this scarce island commodity has long lasting effects on the availability and cost of potable water for Bahamians. If renewable energy technology is deployed in the Bahamas, many benefits would accrue for its citizens including the greater availability of potable water. Today, 3 million gallons of water arrives by barge in

Nassau Harbour from away. Nassau has no potable water for businesses or its citizens.

(WKU)

MT Titus Barge brings 3 million gallons of water to Nassau daily, as a result of no drinkable water in Nassau. Research Question # 2 is not factoring in the positive, as the Government is not transforming its water sector. Renewable energy technology can also make land water accessible for domestic and agricultural purposes, improving supply security while decoupling growth in water and food from fossil fuels. Along different stages of the food supply chain, integrating renewables can improve productivity and reduce losses. The agra-food sector can further bioenergy development, which, when managed sustainably and efficiently, can transform rural economies, enhance energy security, and contribute to environmental objectives.

Is managing water, food and energy possible on Small Island States such as the Bahamas?

It may even be argued that the criminal ills of Small Island States are a result of unsuccessful attempts at engaging in the expensive projects of managing the Nexus instead of attempting to create an island identity based on notions that come from large western countries. Is the current island narco-culture based on historical standards of community, or a result of expectations of

wealth, style, status, and power, all relative to economic growth? Small Island States have a primary responsibility to their children, to provide a healthy environment for their safe and active participation in the community around them. Every child in a Small Island State should be provided with the tools to develop self-esteem, proud, beloved and loving, cherished and respected individuals of their country. Yet, the highest rates of emigration for the youth and the increase in crime among the young of the Bahamas is staggering, and it cries out for review of the social and economic standards developed for the country. A much larger threat to any island state is inattention to its children's future. This unhealthy state poses a much larger threat to the harmony and productivity than any other energy to a country's future well-being.

For Small Island States like the Bahamas it may be unrealistic to believe that western style Nexus policies can be effectively implemented.

Given the current poor reality of many island states especially in the South Pacific and Caribbean region, the central principles of managing the Nexus are not well elaborated or applied, let alone executed. This is in part because heads are now just turning toward this challenge, and in part because the concept is subversive to given holders of power and influence. Power holders do not invite the seeking of means to challenging conventional assumptions and practices. A certain amount of hesitation and consternation is to be expected if the status quo is challenged.

This hesitation has given notions of managing the Nexus a lagging starting place in the race for island self-sufficiency and survival.

How islands got to their current environmental state is the foundation for tomorrow's reality. The intertwined process of status quo inaction and the emerging voices of the proponents of modern Nexus programs adoption are leading toward policies and more importantly action to best understand the opportunity to reverse the trends of

environmental destruction and inability to provide for the Nexus of the Small Islands States. Managing the Nexus is important, yet there is little action evidenced. There is little raw evidence that the Research Questions # 1 - # 4 are being positively addressed, though there is plenty of political rhetoric.

In the Bahamas, with its proximity to the USA, the largest market-driven economy in the world, it has certainly had a large influence on its adoption of western economic goals. Yet, it is questionable if the Bahamas can sustain such goals with its limited natural resource base, highly dependent food import requirements, few fresh water sources, and total dependence on tourism for its commerce and on imported oil el for its energy needs.

Population growth sees global demand for energy will nearly double, while water and food demand is set to increase by over 50%. Meeting this surge of demand presents a tremendous challenge, given competing needs for limited resources amid heightened climate change effects. To overcome the increasing constraints the world faces, we need to fundamentally rethink how we produce and consume energy in relation to the water and food sectors.

Renewable energy technologies provide access to a cost-effective, secure and environmentally sustainable supply of energy. Their rapid growth can have substantial spill-over effects in the water and food sectors. Yet detailed knowledge on the role renewables can play in the Nexus remains limited and widely dispersed.

For many reasons, most of the Smaller Island Nations are not equipped to become equal players on the world's economic playing field. Challenges such as the distance from markets, expensive fossil fuel based transportation, limited natural resources, vulnerable ecological systems, lack of skilled work force, exposure to devastating natural hazards, dependence on outside funding sources and institutions, highly politicized and sometimes unstable environments all

counteract small island economic development in the traditional western sense (Connell 1991). The concept of sustainable development is an on-going process that will continue well into the future. Survival decisions need to be made on every level, with very island nation state. Yet, the use of the terminology of the Nexus is used so loosely that its credibility as a scientific review or solution has hindered the ability to have a meeting of minds in the application of practical solutions.

Discussions of the Nexus topics should have as their basis that sustainable development can be seen as development that aims improving human well-being for the whole society of Small Island States, given inherent environmental resources and financial limitations.

Economic efforts to conform to the western model of development have resulted in an unequal distribution of resources and benefits, projects that work counter to peoples' ability to pursue a self-sufficient lifestyle, disregard for the environment which leads to geographic degradation, and in a reduction of industries focusing on economic success which provided little support for local people, which brings in little more than marginal benefits locally (Griffen, 1994) With few natural resources like agriculture, water and mining to sustain, the Bahamas is uniquely positioned for its existence on the ebbs and flows of only two main industries, tourism and offshore banking. The fortunes and misfortunes of these two main-stays of the Bahamas are totally dependent on policies and economic stability of the outside world.

Managing the Nexus is a widely accepted objective, intuitively. There is a large body of Nexus literature, a wide variety of managing the Nexus applications and a host of useful tools and methodologies.

Nevertheless, the central principles are not well elaborated or applied. This is in part because we are just getting there and in part because the concept is subversive. Seeking the Nexus means challenging conventional assumptions and practices. A certain amount of hesitation is to be

expected. RIVAL Caribbean nations are “leaps and bounds ahead of the Bahamas” on renewable energy implementation. Given the abundance of sun on an almost daily basis, and other unique geographical features that give the Bahamas possibilities in areas such as ocean geothermal energy and wind, this nation has the platform required to be a renewable energy leader - something detailed in numerous reports supplied to the Bahamian government. (Tribune242, 2013)

The Bahamas’ potential in this area is substantial, the nation was some way off both this and its Competitors. Adding that a shift to renewable energy could help reduce business operating costs in the Bahamas, making the economy more competitive by reducing its dependence on volatile, high fossil fuel prices. (Tribune242, 2013)

4.2 Core Objective One, Literature Review:

The method used in this paper is literature review, aiming to broaden the knowledge base in the research area (Kumar, 2011). The theme of managing the Nexus is characterized by the presence of extensive literature and multidisciplinary views that are sometimes contradictory. The literature review was expected to our expand knowledge about managing the Nexus, enhancing it and finding useful new connections for a more encompassing definition of the theme. Based on the works of Gil (2002), Kumar (2011), and Lakat and Marconi (2005), this research was developed in several stages.

After selecting managing the Nexus and its related issues as the object of study, a preliminary review of the literature enabled us to formulate the research problem: the existence of polysemy of the term managing the Nexus and the lack of a satisfactory definition, and its functional use linked to specific interests. The work plan consisted initially in reading and preparing book reports of the books proposed by Visser and the University of Cambridge (2009) as the 50 most

important ones that discuss managing the Nexus. Each new concept associated with managing the Nexus that appeared during the readings was successively targeted for further literature searches in books and papers in the Scopus, ISI Web of Science and Google Scholar databases. Greater freedom of research was employed in order to reach the largest possible number of disciplines instead of focusing on single views of managing the Nexus. During the reading phase, the texts were sorted according to the main themes and theories, and a theoretical framework was built concomitantly and improved continuously (Kumar, 2011). .

In particular, linking the history of managing the Nexus to the evolving vision of development resulted in the most significant points of the literature review, based on the original purpose of the researchers. Before passing on to the writing of the text, based on the theoretical framework, additional literature was searched for and analyzed in order to increase the theoretical consistency of the selected subjects.

Though the concept is relatively new in a historical context, the managing the Nexus focus ranges from the total ability to carry and continue the nature of the planet Earth; to the managing the Nexus of human economic sectors, ecosystems, countries, municipalities, neighbourhoods, home gardens, individual lives, individual goods and services, occupations, lifestyles, and human and animal behaviour interactive patterns with nature. In short, it can entail the full compass of biological and human activity or any part of it. (Ecosystems, 2003)

According to a leading ecology writer Murray Bookchin, the idea that humans must dominate nature is common in hierarchical societies. Bookchin asserted that capitalism and market relationships, if unchecked, have the capacity to reduce the planet to a mere resource to be exploited. Nature is thus treated as a commodity, where resources are extracted and moved to any area that demonstrate demand for those resources. He argued that most of the activities that

consume energy and destroy the environment are senseless because they contribute little to quality of life and wellbeing. The function of work is to legitimize, even create, hierarchy, art and heredity. For this reason understanding the transformation of organic into hierarchical societies is crucial to finding a way forward. (Bookchin, 2007)

Deep ecology establishes principles for the well-being of all life on Earth and the richness and diversity of life forms. This is only compatible with a substantial decrease of the human population and the end of human interference with the nonhuman world. To achieve this, some ecologists advocate policies for basic economic, technological, and ideological structures that will improve the quality of life rather than the standard of living. The notion of quality of life versus standard of living is reaching throughout our societies, and especially grasped by the youth and student populations. They are quite insistent that those who subscribe to these principles are obliged to make the necessary change happen. (Devall, W. and G. Sessions, 1985)

These modern notions of managing the Nexus and ecology on Earth are the result of centuries of human events that has caused significant concern for the welfare of our planet. Our focus on managing the Nexus has its roots dug deep in the population growth, the mass migration of the growing population, the technology achievements, disease, famine, conquests, communications, and religion.

Managing the Nexus in a sustainable manner is a confusing concept that has evolved steadily over the last three decades. (Faber et al. (2005). Literatures shows that there is a plethora of definitions and opinions about the concept of managing the Nexus in a sustainable way. (Kirkby et al., 1995; Lindsey, 2011).

These definitions are often difficult to compare due to their disparity. The concept of managing the Nexus means many things to different people, and this diversity of meaning

tends to increase. As was illustrated at the 1992 Earth Summit in Rio de Janeiro, the difficulty of clearly identifying what managing the Nexus is has been illustrated by the obstacles encountered in passing from theoretical discourse to action, due to technological and political constraints (Matthew and Hammill, 2009).

There are some authors argue that the terms must evolve due to the uncertainty inherent in natural and human systems. (Newman, 2005)

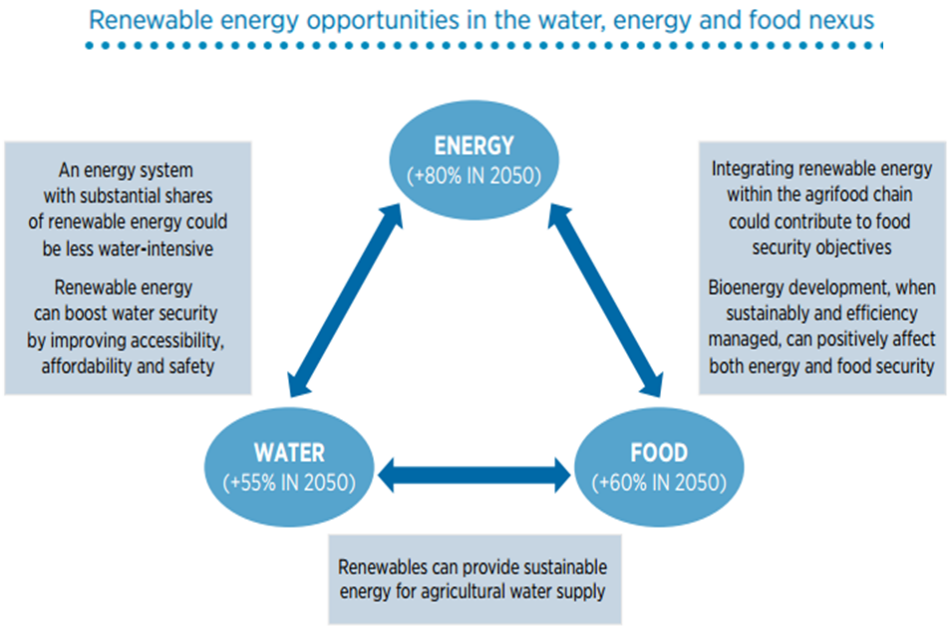
While other authors criticize the existence of so many meanings of the notion of managing the Nexus. (Johnston et al. (2007) Johnston explains how the frequency of diverse definitions has limited the concept of managing the Nexus's credibility, questioning its practical applicability and the real importance of advances achieved so far, and arguing that environmental and social progress based on the concept of managing the Nexus has been limited. While others claim that a satisfactory definition of what "sustainable" actually means is a prerequisite for the formulation of policies. (Rees, 1989)

It is not only possible but is true that the term sustainability holds numerous means, to many authors. It can be seen as an opportunity. (Robinson, 2004)

Robinson suggests that managing the Nexus is a necessarily political act for discussion about what kind of world we want to live in today and in the future, rather than a set of future conditions of society or a process of moving toward some predetermined point of view. This interpretation allows traditional opponents to come together to discuss under the broad shared banner of managing the Nexus. "The concept of sustainable development represents a shift in the understanding of humanity's place on the planet, but it is open to the interpretation of being anything from almost meaningless to being of extreme importance to humanity". (Hopwood, et. al., p. 40).

The stresses and strains on the world's ecosystems is pronounced and possibly heading toward oblivion. With global population passing 7 billion inhabitants, the advancements of technology, the velocity of production is replacing traditional methods of work and tools; all factors are radically changing the demands on the Earth. Changes are fast and relentless, within industries, within regions, within age groups and within agriculture.

New machine technologies, synthetic fertilizers, and biotechnology advancements may be changing the landscape and possibly relegating traditional food processing to the history books.



(from IRENA's *Renewable Energy In The Water, Energy & Food Nexus*)

'Have not' nations are now experiencing declining populations, as emigration shifts toward 'have' nations such as Canada, who hold vast fertile lands of plentiful abundance.

In their book, 'For the Common Good', Herman E. Daly and John B. Cobb Jr. discuss the surge of interest in sustainable growth or sustainable development within development agencies, following the publishing of the Brundtland Report in 1987. He point out that both terms of

sustainable growth and sustainable development are used synonymously, but in error. They believe that growth should refer to the qualitative expansion in the scale of the physical dimensions of the economic systems; while development should refer to the qualitative change of a physically non-growing economic system in relation to the environment. (Daly & Cobb, 1994) It stands the scrutiny of logical critique that any physical subsystem of a finite and non-growing Earth must itself also become non-growing over time.

Therefore, the words sustainable growth is contradictory, as it is only a length of time that will render all growth to a non-growing state. Daly and Cobb actually call sustainable growth a 'thought stopping oxymoron'. (Daly & Cobb, 1994) They propose that environmental Managing the Nexus is within the notion of optimal scale. Markets see only efficiency, as they have no organs for seeing, feeling, justice, or hearing. Managing the Nexus, on the other hand, is justice extended to the future. (Daly & Cobb, 1994)

The academic concept of the Nexus is a recent development. In the early 1980s, Lester Brown, the founder of the Worldwatch Institute, defined a sustainable society as one that is 'able to satisfy the needs without diminishing the chances for future generations.' (Brown, 1981) His definition reminds us of the importance to pass on to our future generations a world with as many opportunities as we inherited. By modeling after nature's ecosystems, we do not need to create the human Nexus model from scratch. By modeling after nature's sustainable communities of plants, animals and micro-organisms, we can design a sustainable human community similar to nature in that its way of life; businesses, economy, physical structures, and technologies complement nature's ability to sustain life. But first we must become environmentally literate. We must come to understand that waste can be food, and that all waste can be reused in a sustainable manner. By understanding and copying nature, we will realize that

there is no waste that cannot be reused.

In his Hidden Connections, Fritjof Capra tells us that there are six principles of ecology 'that are critical to sustaining life: networks, cycles, solar energy, partnership, diversity and dynamic balance. (Capra, 2004) His notion of Ecoliteracy requires that children and adults become familiar with the concepts of sustainable living. He believes that we all should have an understanding, a literacy of life at its very centre, in order to overcome our alienation from nature and begins the relationship that can be called sustainable. Ecoliteracy is the first step in the pursuit of a truly sustainable community. (Capra, 2004)

Ecodesign presupposes that we can learn from nature and adapt its patterns and networks and shape the flow of energy and materials for human purposes, at the same time as being conscious of our relationship with nature. Nature's design and technologies have evolved over billions of years, without using up nature's capital of resources and ecosystem services of which all things depend. (Capra, 2004).

A business that is practicing sustainable principles will recognize that the waste of one organization can be the resource of another industry. Wood chips from a furniture manufacturer become the resource to produce press board for the housing market. Used steel becomes the feed stock for the smelters of Dofasco and Stelco in Ontario.

In the early 1990s, a business entrepreneur Gunter Pauli created an organization called Zero Emissions Research and Initiatives (Zeri). He introduced the notion of business networking and clustering by promoting the principles of zero emissions. Pauli understood nature's model of zero emissions. (Capra, 2004) Imagine how much waste is created by cutting a 2 X 4 from a tree? Imagine how many tires get thrown into ground based waste facilities? Imagine how many plastic bags are buried in land fill sites? Any of these processed items can be re-cycled in order

to create no waste. A company in Ajax, Ontario re-cycles car and truck tires with their patented innovative technology. Their Chairman Dr Steve Simms told a shareholder's meeting: "Environmental Waste Management picked its company name very deliberatively. We strongly believe in the sustainable model, where all waste gets re-used. At Environmental Waste Management we believe that we all should be managing our environment. We have put our money where are words are." (Simms, 2010)

Gunter Pauli's principle of zero emissions also implies zero material consumption from nature. Like nature, man's energy needs are satisfied by the sun, which does not consume any fossil fuels. All material goods would come from re-cycled materials. Zero emissions also imply zero pollution, which totally eliminates the sources of greenhouse gases. (Capra, 2004)

Environmental clustering shifts the economic focus from production at the raw materials level to re-cycling at the labour level. This creates new jobs, eliminates pollution and reduces capital outlays.

Ecodesigners Michael Braungart of Germany and William McDonough of United States speak of two kinds of metabolism; the biological metabolism and the technical metabolism. (McDonough & Braungart, 1998) Matter that re-cycles in the biological metabolism is biodegradable and becomes food some something on the food chain. Matter that does not biodegrade, continues to re-cycle in the industrial cycles and is known as technical metabolism. Both re-cycle and assist in the production of a sustainable economy. In order that the cycles continue to optimize, they should not co-mingle, but remain separate forever. (Capra, 2004) In United States, half the new steel is produced from old steel scrap and reclamation. Paper mills are not locating near forests.

They are locating near cities, where their waste paper raw material is found. Northern New Brunswick was once the region of numerous pulp and paper factories. It is also the region of vast forests. Well, most of the pulp and paper factories have closed, because the demand for pulp and paper has greatly diminished. The use of Internet news services, as well as recycling waste paper, has disrupted the traditional newsprint industries.

Ecodesigners are confident that it is possible to reduce the consumption of energy and raw materials. Ecodesign principles such as networking, recycling, and optimizing instead of maximizing have not been the general practice of industrial design. Ecodesign is also good business, as present inefficiencies almost always cause more than the remedies. (Capra, 2004)

New architectural design incorporates Ecodesign principles. This is creating a new era for the building design industries. McDonough and Braungart envision buildings like tress, where each building would purify air, accrue energy from the sun, produce more energy than it consumes, create shade and soil, and change with the season. (Capra, 2004)

4.3 The Stockholm Environmental Institute

The Stockholm Environmental Institute explains the concept of Nexus as an approach: "The nexus approach means systemic thinking and a quest for integrated solutions to guide decision-making about resource use and development, to minimize externalities and ensure true sustainability. There is a growing recognition around the world that this is, indeed, the best approach, given the complex linkages and feedbacks involved. But successfully applying nexus thinking to specific locations and challenges is by no means a small task." (Stockholm Environmental Institute)

4.4 Core Objective Two, Analysis of a Small Island State:

What are the Challenges Affecting Small Island States such as the Bahamas?

There is an unquenchable thirst for power, power to drive island economies to higher standards of living and sustainable water, food and manufacturing self-sufficiencies. Islands cannot afford to build larger fossil fuel turbines to generate more power, in order to satisfy this thirst. They are realizing that there are other and less expensive means to produce and consume energy more efficiently. As islands get more focused on efficient means of consuming energy, they will find enormous benefits to their island's development.

Islands are at the point of a new paradigm in their histories, whereby using energy more efficiently by multiples of 300% and 400%, that can achieve more output in a sustainable fashion. Big savings can be cheaper than small savings, when innovative technologies are used. This applies to all energy consumption, from the use of cars and trucks, to buildings, and even to large utilities.

4.5 Bahamas could be the Agents of the New Age, the New Resolution

The new norm for island energy usage in the 21st century is to use less energy and create energy in a sustainable manner. The use of cars is gradually being replaced by more public transportation, powered by electricity. Solar energy was once considered too expensive to be a realistic alternative to fossil fuel energy. In April 2012, solar energy companies won the bid for 4 billion watts of new energy auctions in California. There are over 30,000 passion energy buildings in Europe as of 2014. It is less expensive to save energy than it is to supply energy. Long electrical grid lines are inefficient forms of energy transmission. Over 5% of energy is lost by attenuation that is the loss of energy by way of friction in the lines. New technologies are being produced that will allow for energy to be transmitted without loss. The goal for transmission lines is to be able to transmit power for many thousands of miles without loss. The savings for power transmission between islands would be very significant.

The power needed to produce an economic unit of output is falling as a result of innovation. Cleaner, less expensive power allows island nations better opportunity for self-sustaining economies. The pressure to reduce energy costs are increasing significantly. In the Bahamas, the energy bills paid per kilowatt are approximately 50 cents per kilowatt.

This electrical rate is about 400% higher than the electrical rates of Prince Edward Island. New solutions must continually be found to reduce per kilowatt charges in a nation where the minimum wage is $3.75 per hour. Power bills are much higher than mortgage bills in the Bahamas.

The energy challenges of cities such as Nassau are ever-increasing. The population of Nassau is now approximately 300,000. Large buildings are being built to house the population. Large buildings create an urban heat island effect, where heat is trapped in the cities. Nassau is a low-energy resource with a high-population density environment. This is not unique to Nassau only. Caribbean cities such as Freeport, Kingston, Santo Domingo, Havana, Port-au-Prince, Puerto Plata and San Juan are large island cities that have created this heat island effect of increasing temperatures.

New innovations of rainwater water cooling and solar air conditioning can reduce the heat island effect, which in turn reduces the cost of power. Reduction in the costs of power can amount to millions of dollars available for other projects.

The Caribbean islands have an unlimited amount of the greatest energy source in the world, the Sun. By achieving better, sustainable power efficiencies and energy usage, island states achieve higher levels of energy security, reduced social unrest and conflict, abilities to invest in further energy related energy learning and career development, and more social advancements.

Most island states have been dependent upon large multi-national utility companies to provide energy for their power needs. Technology innovation allows island states to change the way that they create energy. A Canadian based energy company Emera owns the Grand Bahama Power Company, the Barbados Light and Power Company, the St Lucia Electricity Services Company and the Dominica Electricity Services Company. Emera is a natural gas focused energy facilitator, without any renewable energy projects contributing to their energy grids.

4.6 Renewable Energy Technology Advantages

There are many challenges in creating energy on islands. Emerging technologies can play a continuing role in providing more efficient means of producing, using and transmitting energy in island states. Islands must learn to do more while using less power.

The range of technology that is available now expands by multiples on a daily basis. Yet, the way that islands produce electricity and move it around, has not evolved much during the past 100 years.

New computers, smart phones, DVDs, digital games and high definition television see people concentrating on a multitude of new consumer technologies. Yet, the technologies that create energy, the diesel driven turbines and electricity generators and transmission systems have not evolved.

As a result of technology evolution, islands can meet their domestic energy needs by improving efficiency rather than boosting production with fossil fuels. Islands cannot financially afford to use more and more diesel generated energy even if it is of higher quality.

Building ever larger, more complex, more centralised energy utility facilities, is costly and

inefficient. This is yesterday's solution to increasing power demand.

Islands today are seeking a different approach to increasing demands on energy. Better and more efficient use of energy and a shift to renewable sources that can be matched in size or scale and in energy quality to the demands that island economies have as their tasks is the next paradigm in island energy creation and usage.

Instead of doubling the fossil fuel turbine technology to increase production, it is time to change thinking in order to achieve much more out of renewable energy sources, which in turn will expand returns with clean, sustainable energy sources.

A shift in using less energy, more efficiently will provide islands with a sustainable energy opportunity. New era job opportunities will see careers of engineers and architects that will be rewarded in the amount of savings that their clients will achieve by using new energy technologies.

By using less expensive, sustainable energy sources, the island nations will be in a better position to grow and spread wealth throughout their nations. The notion of Peak Oil has told the world that oil will not last forever. Islands must embrace new technologies to use less energy, in a sustainable fashion.

5.0 Brundtland Commission

Moving forward to the 20th century, the World Commission on Environment and Development, known as the Brundtland Commission, published its ground-breaking report in 1987. The addition to the Nexus body of work was when they presented a new concept, the concept of sustainable development.

This new concept of sustainable development became one of the most successful approaches to be introduced in many years. It assisted to shape the international agenda and the international

community's attitude towards economic, social and environmental development. (UNECE, 2005)

The Report defined sustainable development as development which meets the needs of current generations without compromising the ability of future generations to meet their own needs.

The Report promotes strong economic and social development, in particular for those communities with a less than average standard of living. At the same time it stressed the importance of protecting the natural resource base and the environment. The Report also stressed that intergenerational solidarity is also critical, underlying that all economic and social development should take into consideration its influences on the development for future generations.

At the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, the Report documents were approved at the Conference, notably the comprehensive Agenda 21, which included commitments by world leaders to ensure sustainable development in many areas and on all levels of society. (UNECE, 2005)

National committees for sustainable development were established on a high political level in many countries. Agenda 21 documents and action plans were drawn up in many municipalities.

As a result of discussions that involved this Report, notably characteristics of the term "sustainable development", is that it can mean all things to all people. The term sustainable development was used as an alibi rather than as guidance for strong action. (UNECE, 2005)

These advocates stressed more emphasis on the economic and social "pillars" of the Report.

Recently it has been argued that the political acceptability of sustainable development depends on a country’s ability to respond to its social challenges.

Though the Report created a significant momentum, it also created numerous definitions

unanswered. Nevertheless, the international community has continued using the terminology of sustainable development. The vagueness of the concept had enough strength and purpose to become operational enough to make meaningful action in pursuit of sustainable development possible and broadly supported.

The 2002 Johannesburg Summit on Sustainable Development showed that the enthusiasm of Rio now included high-level political support for the process persisted. Johannesburg also boldly highlighted the implementation of commitments rather than spending time on drafting new declarations. The identification of key problem areas has become more specific and the conclusions more action-oriented.

The topic items for 2004-2005, water, sanitation and human settlements, are certainly not unique to this new stage of the Report, yet the sustainable development themes were getting out into the global interest groups.

With more than 15 years since the first Report, sustainable development work has produced both successes and challenges, yet it had created themes for discussions. The clearest successes is the widespread local activity, which represents thousands of municipalities have taken the promotion of sustainable development seriously, with subsequent increased awareness and improved performance. Yet, as often happens answers create more and more questions. Questions such as lack of understanding of the concept and roles in administrations, insufficient political support, limited resources at different levels for effective action, inadequate involvement of civil society, inertia in education systems and various problems in specific sectors of the economy. (UNECE, 2005)

One of the cross-cutting issues to promote sustainable development that has gained prominence recently is education. The United Nations Decade for Education for Sustainable

Development starting in 2005 and led by the United Nations Educational, Scientific and Cultural Organization (UNESCO) illustrates the importance of education in achieving sustainable development. The drafting of a UNECE strategy for education for sustainable development, which was initiated by the Environment Ministers at their Conference in Kiev in May 2003, shows that there is support in the region for an operational commitment to it. (UNECE, 2005)
An important conclusion is that sustainable development is a process, not an end in itself. It also implies that participation and genuine dialogue among stakeholders are key prerequisites for sustainable development. Sustainable development needs interactive thinking, but it can also help strengthen democratic institutions through consensus-based public participation.
Clear notions of sustainable development are still ambiguous. The UNECE strategy for education for sustainable development was prepared by intergovernmental negotiations without an explicit definition of the concept. (UNECE, 2005)

5.1 Bonn2011 Nexus Conference Objectives

(UNDESA)

Another milestone conference of note was the Bonn2011 Nexus conference. Its focus was to initiate integrated solutions for the Green Economy. Held from the 16th to 18th of November 2011, the German Federal Government organized the international Conference "The Water Energy and Food Security Nexus – Solutions for the Green Economy" as a specific German contribution to the UN Conference on Sustainable Development "Rio2012".

Global Trends such as population growth and rising economic prosperity are expected to increase demand for energy, food and water which will compromise the sustainable use of natural resources. Besides positive effects, this pressure on resources could finally result in shortages which may put water, energy and food security for the people at risk, hamper economic development, lead to social and geopolitical tensions and cause lasting irreparable environmental damage. To develop policy recommendations based on multi-stakeholder consultations and adopting a nexus perspective

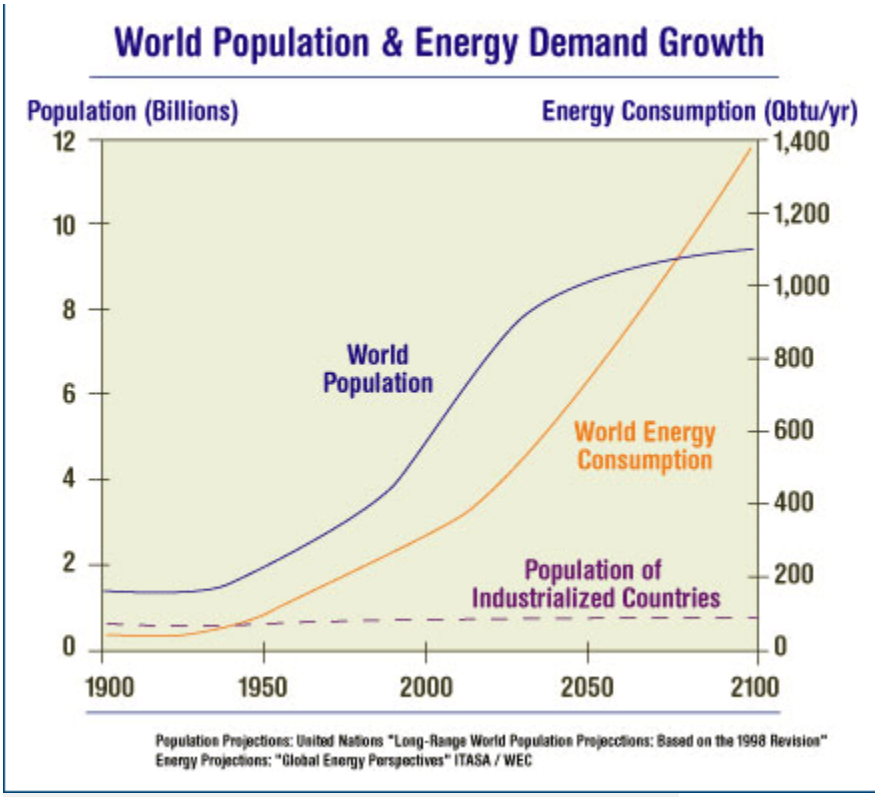
To facilitate the definition of key elements of a common agenda to better achieve water, energy and food security for all. To position the Water, Energy and Food Security Nexus perspective as a key dimension of the Rio+20 process. The United Nations General Assembly has decided to convene a Conference on Sustainable Development in June 2012 as the twenty-year follow-up to the groundbreaking "Earth Summit" of 1992. Germany provided a platform for all stakeholders to develop a common policy agenda to achieve Water, Energy and Food Security and specific recommendations on how to position the Nexus perspective in the Rio+20 process. (Nexus, 2011)

To launch concrete initiatives to address the Water, Energy and Food Security Nexus in a coherent and sustainable way. The Bonn2011 Nexus Conference developed concrete initiatives to foster action in Nexus-relevant policy fields. To foster action on Water, Energy and Food Security, the Bonn2011 Nexus Conference offered a high-level platform to explore cooperation and promote initiatives as well as policy commitments that address the issues and challenges within the Water, Energy and Food Nexus. (Nexus, 2011)

5.2 Club of Rome

The Club of Rome's 1972 work called "Growth in the Human Ecological Format Futures from 1972 – 2100" explains the limits of growth in terms of the nature of global limits and the human

ecological footprint, currently taking 1.8 hectares of land to keep a person in food for one year. They discuss the importance of our access to renewable resources as well as our ability to get rid of toxins for our Earth, because too many toxins kills the Earth. The Club of Rome believes that the world has moved into over-shot mode in the 1980s, whereby unless the human footprints moves back the world will collapse. (Club of Rome, 2000)



[United Nations, National Energy Technology Laboratory]

5.3 Managing the Nexus, Challenges in Small Island States

To the unwary, gated Bahamas resort island visitor, the economically and politically disadvantaged island reality may go un-noticed, as he is shuttled to and from the airport in an armed vehicle. The gated and armed resort is an un-natural, man-made island within the vulnerable, natural island, created in order to propagate the images of pleasure, warmth, soothing waters, tropical foods and drink. These images do not reflect the economic or political realities

of the small islands. Yet, they do reflect the needs of the well to do North American and European tourists to relax in an insulated time capsule, where all forms of this new reality have been manufactured by non-islanders to simulate island utopia.

The serious challenges created by insularity and remoteness have been the focus of a number of NGOs, including the United Nations. A comprehensive document was prepared by the UNCTAD in 1988 as a precursor for a meeting of a group of experts on Island Developing Countries, held in Malta in April 10988. (Briguglio, 1995). As a result of this deliberation; "…the Malta meeting led to a UN resolution recognizing that in addition to the general problems faced by developing countries, island developing countries suffer additional handicaps arising from the interplay of such factors as smallness, remoteness, geographical dispersion, vulnerability to natural disasters and a highly limited internal market." (Briguglio, 1995)

In 1983, the US invaded the small island of Grenada. This invasion brought international focus and concern over the overt vulnerability of small islands. As a result of the Grenada invasion, small islands were beset upon by external do-gooders, who sent in aid, created treatises, and volunteered to rescue the island from its current situation. The verbiage of micro-state policy makers as well as mainstream neo-classical economic advisors found much fuel in the vulnerability of Small Island States, as a result of the invasion of Grenada. (Baldacchino, 2000) Media images of Grenada at the time of the invasion hardly represented a beautiful and tranquil oasis for bodily rest and rejuvenation.

Even the apparent openness of an island's constitution as a result of being a colony to a foreign country, leaves the island vulnerable to 'head office' dictates and directives. Well documented incidences of disease transmitted from the European countries to the islands have left the

vulnerable islanders close to extinction. Yet, island vulnerability requires that the islands remain favorably inclined toward attracting direct foreign investment, educational institutions, and technical skills and to bridge links to the great outside. (Baldacchino, 2000)

As a result of vulnerable, limited island economic opportunities, their politics are often the politics of divvying up the spoils attained from power, versus debating and fulfilling public policy. Politics on islands is often viewed as old style politics, '…where the robust push and shove of political activity is primarily concerned with gaining the spoils of power within an existing framework." (Buker, 2005)

Unless the constituent is the recipient of the some of the spoils of power, then they are vulnerable to the decision-maker's favoritism. In other words, island vulnerability comes from within the island's political system, as well as all of the outside influences as mentioned above.

6.0 Are there any Basic Shared Characteristics of Sustainable Island Life?

In order to understand the shared characteristics of island life, the use of at least four operationally related filters can be utilized. The four shared features of islands are: Totality, Monopoly, Intimacy, and Emigration. (Baldacchino, 2000) Though each island country is unique, these four lenses of categorizing island characteristics are helpful tools in quantifying data within a global island framework.

Governments in small islands require a limited amount of layers or strata's, unlike their continental counter-parts. Critical mass can be achieved with considerably less space between the people and their government. The smaller the island, the more the government participates in its economy and culture. (Baldacchino, 1997)

Decision making for sustainable energy, water and food projects should be quick and effective, yet real life examples proves different. In the Bahamas, Larry Smith wrote on August 5, 2013

under the title Bahamas' Incoherent Energy Policy, that the budget proposals relating to the state-owned Bahamas Electricity Corporation are clear evidence of the government's failure so far to create a new energy model for the country. He noted that the notion of that model has been outlined over the past two administrations, yet still not solidified into law. The proposals call for changes to the Electricity Act (which dates to the 1950s), a modern Renewable Energy Act to provide a framework for alternative energy production, and a new management regime including a waste-to-energy plant at the environmental disaster we know as the Harold Road landfill. The landfill project and the proposed waste to energy project have not materialized, though many proposals have been submitted by private industry participants. During the summer of 2013, Environment Minister Ken Dorsett made an aggressive statement to parliament confirming that the government was "working assiduously" to achieve these goals. But only recently, State Investments Minister Khaalis Rolle admitted the entire situation was "still under review". (Bahamas EcoForum, 2013)

This illustrates the inaction by the Bahamian government. The Bahamian government appears to be well meaning without the execution of sustainable policy. Interestingly, due to the nature of word of mouth communications on islands, a shared and effective information dissemination characteristic is known as Grapevine communications. (TMI, 1997) Grapevine communication methods are far more efficient to get ideas, rumours, awareness and caution into the mass population. In the Bahamas, citizens shared information quickly and accurately regarding natural disasters like hurricanes. All of the population knew when the hurricanes would arrive, how large they would be, and how long they would last. Now, the local 'buzz' is more often than not, talks on the high cost of electricity. Some people

known to this author spend more than $3,500.00 per month on their electricity bill!

Governments on islands can also use Grapevine networks to send up trial balloons, testing the political impact of new legislation prior to enactment. If the population reacts to the trial balloon negatively, the government can temper the new legislation. They actually create a spin-off bonus wave of public gratitude for not introducing the onerous new law. (TMI, 1997) Successful politicians realize that sources of power are created by networks, coalitions and friendships, which fully utilize information links. They understand that knowledge is power. Information or economic supply links, purchasing links, support links and business friendship links all work together to consolidate political and economic power on islands. (Fineman & Yioannis, 1996)

6.1 Does Island Size Make a Difference? If so, how?

Island history has been dictated and manipulated by larger external powers for centuries, where size does make a difference. The study of islands is the study of relativity, and necessarily includes the study of the powerful exterior forces and their influences on the smaller island environment. Even to the level of studying island landscapes one notes that seemingly island indigenous plants such as the casuarinas, hibiscus, and the wisteria are in fact imports from the larger foreign countries. Certainly the significant historical roots of the slave economy of the Caribbean has their genesis and control from the larger European countries. Their commodity based slavery system originated from a larger culture, created and greatly influenced the cotton and sugar cane economies of the smaller nations of the Caribbean. (Deloughrey, 2004)

Peeling back the onion and studying islands well beyond the all-inclusive holiday resorts and the gated communities will demystify the notions of beautiful islands as small, self-contained oasis retreats for their western participants. The study of islands is a study of the big against the small, the powerful against the weak, the global transplantation of flowers and seeds, of different

peoples and of cultures, of political regimes and of the possibly of sustainable economic systems. This interplay between large and smaller represents an important component of the human drama and of history of the human race for time in memoriam. The study of islands pulls the notion of timeless isolation into a different level. By studying islands we study the 'convergence of global forces onto island spaces, rendering both human and natural narratives as part rather than outside of the modern historical process.' (Deloughrey, 2004) Small Island States are a microcosm of our Earth, and as a result are more accessible to understanding.

6.2 Notions of Island Self-Sufficiency

Island self-sufficiency is not a recent phenomenon. El Hierro, an island of only 269 km2 and around 10,000 inhabitants in the Canaries archipelago, an autonomous region of Spain and an EU outermost region situated in the Atlantic Ocean off the coast of Africa, is a certified UNESCO Biosphere Reserve. The island hopes to become one of the first entirely energy self-sufficient islands in the world.

More than 10 years ago the island started to look for alternative renewable energy sources to replace the power station, which uses fuel and provides most of the island's electricity. The exploitation of a single resource would render energy production uncertain. Therefore the island looked for a combination of different energy sources to make the complete self-sufficient energy system viable in the long-term. With the approval of Plan de Sostenibilidad de El Hierro (El Hierro Sustainable Plan), the island started a complete reorganization of the island's energy production concept. Most of the energy would come from a hydro-wind power station. (IUCN, 2012)

A wind farm would produce the energy and a system of two connected water reservoirs would be

the power storage battery (or accumulator) and would provide a supplementary source of energy. This wind-water system should produce up to 80% of the island's energy requirements. The sun, through the solar farms, should provide the rest.

At present, the civil construction work is nearing completion. A wind farm and other mechanical components, hydraulic pumps and hydraulic turbines, are being installed and in the end of 2012 operational testing of the system will begin. The whole island is a Biosphere Reserve and 59% of its territory is comprised of natural protected areas, but the spot where the project is developed is specifically located outside of them. (IUCN, 2012) The Government of the Canary Islands, an IUCN Member works on this project together with a number of other partners.

6.3 Can an Isolated Island like the Bahamas be Self-Sufficient?

Is it possible for an isolated island to be energy, food and water self-dependent and sustainable? The challenges and vulnerability of a small island nation situated thousands of miles from the mainland in fact provides its own motivation to direct its own resources and opportunities to be energy self-sufficient. (Royle, 1989). To the outsider, the challenges of island energy self-sufficiency and vulnerability appear to be over-whelming.

We know that fossil fuels have a finite life span. We know that oil, coal and diesel will not provide the world's thirst for energy an unlimited amount of feed-stock for centuries to come. Furthermore, we know about the effects of carbon based fossil fuel emissions on the atmosphere, on the oceans, on the farms, on the animals and on the people. Al Gore, David Suzuki and many other scientists and academics have demonstrated the effects of fossil fuels on the Globe. Possible island vulnerability acted as instigators and motivators to exert their independence from outside dominance, and to provide a sustainable standard of living.

6.4 Small Island States and Peak Oil

The Peak Oil theory is the simplest label to best understand the challenges of global oil availability and production. As most nations depend on oil to power their energy production, the price of oil is critically important. Oil is depleting daily. There is only a finite amount of oil left in the Earth to exploit. Oil is non-renewable, though it has powered all sectors of the Global's economic growth for the past 150 years.

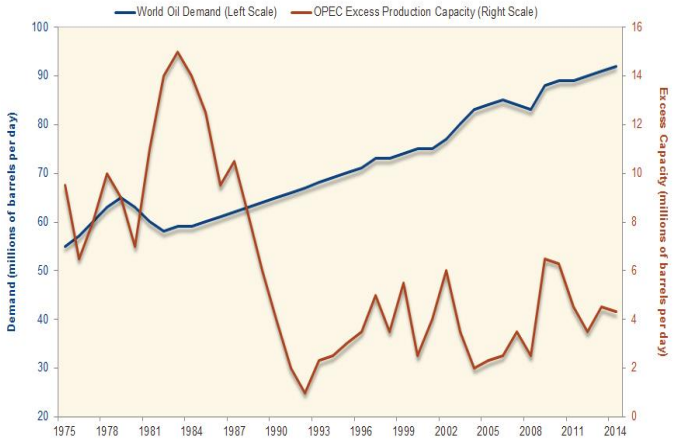
The rate of oil production refers to the extraction and refining of this fossil fuel. Most oil producing countries are witnessing an irreversible decline with their oil production.

Global Oil Production in Millions of Barrels per Day

	1998	2008
Nigeria	**2.11**	**1.95**
USA	**8.37**	**7.52**
Mexico	**3.50**	**3.16**
Australia	**0.71**	**0.55**

(Simmons, 2009)

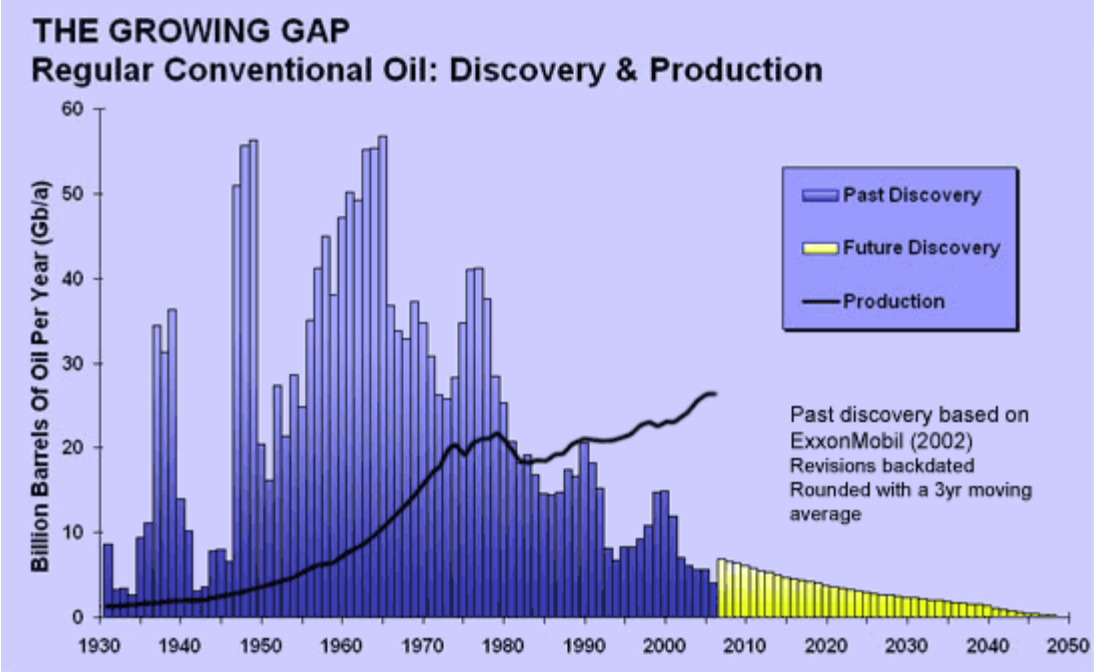
The peaking of oil production suggests a number of enviable events to come. Peak oil does not mean that there will be no oil next year. It does mean that the cheap oil reality of the past 100 years will remain a part of the history books. Economies that base their domestic growth on the fossil fuel model, will find high costs of energy will dampen their growth potential. As the chart below illustrates, the demand for oil globally is increasing yet the production of oil is decreasing.



Source: Simmons & Company; 'Oil Macro: Oil Supply & Demand Balances'; December 2014

Without significant changes in economic models toward renewable energy systems, the fluctuating prices of oil will put a strangle hold on country growth. Below, please note the chart demonstrating the significant rise in the price of oil since March 6, 2009. On April 10, 2014 it traded at $110.00. Oil hit $34.00 per barrel in March 2009. Indication trends suggest that oil will break through its all-time high of $147.00 USD per barrel, contrary to current prices. This chart below, illustrates the growing gap between production rates and oil reserve discoveries.

In his best seller, Why Your World is about to get a Whole Lot Smaller, Dr Jeff Rubin, past Director and Economist of CIBC World Markets, believes that the world is heading for the exit lane with regards to oil. He believes that the ever-rising price of oil is creating a world where people no longer can travel, where we focus more on our life experiences in a smaller world. He believes that the higher cost of fuel will create innovation locally where people figure out how to grow their own foods in their backyards, where their world will be anchored in local significance and local custom as it was a millennium ago. (Rubin, 2009)



Source: www.aspo-ireland.org (ASPOG, 2009)

6.5 How the Peak Oil Theory Impacts Small Island States

Despite a strong increase in the interest for renewable energy in the recent years, status quo scenarios depict an energy future largely dominated by fossil fuels. This attitude has to change. Current renewable energy contributions to total energy consumption remain at very low percentage rates. Royal Dutch Shell geologist Dr Marion King Hubbert coined the phrase 'Peak Oil Theory' in 1956, as a result of research done on the relationship between the then known supply of oil and its co-relation to the demand of a predominantly fossil fuel driven world economy. He predicted global production of oil would peak around the year 2000. Current oil reserve numbers tell a story that confirms that Hubbert was right. Dedicated actions are therefore required for profiling renewable energy as an attractive alternative to fossil-based energy, most especially for islands.

In the Bahamas, the average piece of food is transported 2,000 miles from where it is produced to where it is consumed, because the Bahamas do not have a significant agricultural industry.

Food containers are transported on vessels powered by bunker sea oil.

The oil based economies do not need to deplete their entire reserve of oil before they begin to collapse. A shortfall between demand and supply as little as 10 to 15 percent is enough to wholly shatter an oil-dependent economy and reduce its residents to the poor house.

During the 1970s, a natural gas production drop of less than 5% caused prices to skyrocket by 400%. The coming oil shocks won't be so short lived, as they represent the onset of a new, and permanent condition. Production is dropping (conservatively) by 3% per year, every year.

War, terrorism, extreme weather and other geopolitical factors will likely push the effective decline rate past 10% per year, thus cutting the total supply by 50% in 7 years.

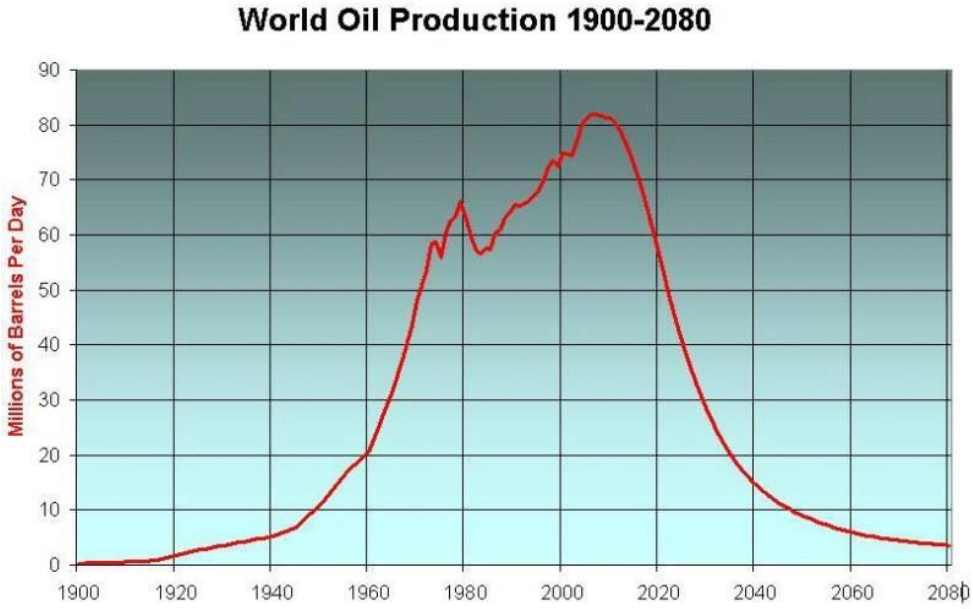
World demand for oil continues to increase, and supply continues to decrease. China is a substantial net importers of oil, having very little domestic production.

The consequences of this trend are almost unimaginable. We will find ourselves slipping into a brand new paradigm, where the declining reserves of oil cannot fuel the ever-increasing economic systems. How will this affect the Bahamas? How will islands plan for their economic survival?

The economic fallout from high prices will almost certainly create higher geopolitical tensions, thereby further hampering the development of large-scale alternative sources of energy.

Institutional investors treat geopolitical challenges as direct threats to their desire and ability to invest in new energy technologies. Large capital pools will be required to build renewable energy systems. The return on investment ratios (ROI) must be attractive and make sense to investors. Is this a viable possibility given today's renewable energy technologies and today's geopolitical forces?

The consequences to islands of the Peak Oil Theory are almost unimaginable. Permanent fuel shortages would tip the world into a many decade - long economic depression, unless renewable energy systems are deployed as soon as possible. Millions would lose their jobs as industry implodes. Farm tractors would be idled for lack of fuel, triggering massive famines. Energy wars would flare.



6.6 Energy Technology Source Changes

In the 12th century, Basque sailors hunted right whales for their oil. By the 16th century whales were hunted around Iceland, to provide oil for the European demand for lighting fuel. From the middle of the 19th century, whale oil provided the major source of artificial lighting in America and Europe. But in the middle of the 19th century, America and Europe faced an energy crisis. The price of whale oil was rising. From a low of 23 cents a gallon in 1832, it rose to $1.45 a gallon in 1865. This was possibly the first oil crisis that Iceland experienced. (Baucus, 2005) The rising price of whale oil encouraged an engineer to invent a process to convert that western Pennsylvania black oil into a new fuel, kerosene. The whale oil era was ending, and the

petroleum era began. (Baucus, 2005) Now, 150 years later, the petroleum era is visualizing its diminishing longevity, and a paradigm shift is beginning to take shape.

6.7 Populations Push Unknowingly Hard on the Sustainable Island Envelop

The population of Europe, which included Russia, had been about 100 million in 1650. It grew to about 170 million people 100 years later, and by 1800 was past 200 million. (Trewartha, 1969) The population of England and Wales grew by a mere 1% in the 1720s, by 4% in the 1750s, and by 10% per decade as the world witnessed 1800. (Tranter, 1973) Most of this population explosion was experienced in the cities, such as Paris, London, Rome, Madrid, and Hamburg, as the rural farming communities could no longer keep up with the demands of their inhabitants. The decline of diseases such as small pox, also helped spur population growth in the 18th century. Increasing food supply in Europe from the new colonies also added to the increasing population numbers.

Yet, the growing miss-match between people and resources was observed by the Englishman Thomas Robert Malthus. In 1798, he wrote the now famous text called for short, the 'Essay on Population', where he focused on the greatest problem and challenge that faced the human race. In it he wrote that: "…the power of population is infinitely greater than the power in the Earth to produce subsistence for man." (Malthus, 1969)

Populations in England, France and America were doubling every 25 years during the late 18th century and early 19th century. As fresh land was being opened up in the colonies, food stuffs were also being produced at a faster rate than previously witnessed. Malthus was concerned that food stuff growth could continue to double over and over again. As he stated: "This is contrary to all of our knowledge of the qualities of the land." (Malthus, 1969). Malthus forecast that there

would be an even greater gap between the demand on food and the land's capacity to meet this demand. He believed that the result would be increasing starvation, mass deaths through famine and disease, and a decline of the social fabric. He felt that population growth meant that the human reality would worsen, with the existing gap between the 'haves' and the 'have not's, which would inevitably lead to increased pressures upon the Earth's resources.

Population's increased pressures upon nature would fuel the great divide between the more fortunate and the less fortunate. Certainly, poverty on the rural areas was widespread. People moved into the cities by the hundreds of thousands, looking for food, work and shelter. Canada's migration from Scotland and Ireland in the late 1700s and early 1800s was as a result of many unmanageable conditions back home. The potato famine, discharged officers from the Napoleonic Wars, Scottish artisans, Irish paupers, religiously persecuted, over population and a strained welfare system in Ireland and Scotland, arrived to Upper and Lower Canada destitute or with few resources to take up the pioneering life. (McInnis, 1947)

Fortunately, there were three evolutionary transitions that were at play during Malthus' era that spared Europe the devastation that he predicted. The three forces that emerged, and inevitably kept the wolf from the European door, was immigration, technology improvements to the agriculture industry, and lastly was the vast leaps of technological productivity caused by the Industrial Revolution. (Mathias, 1969)

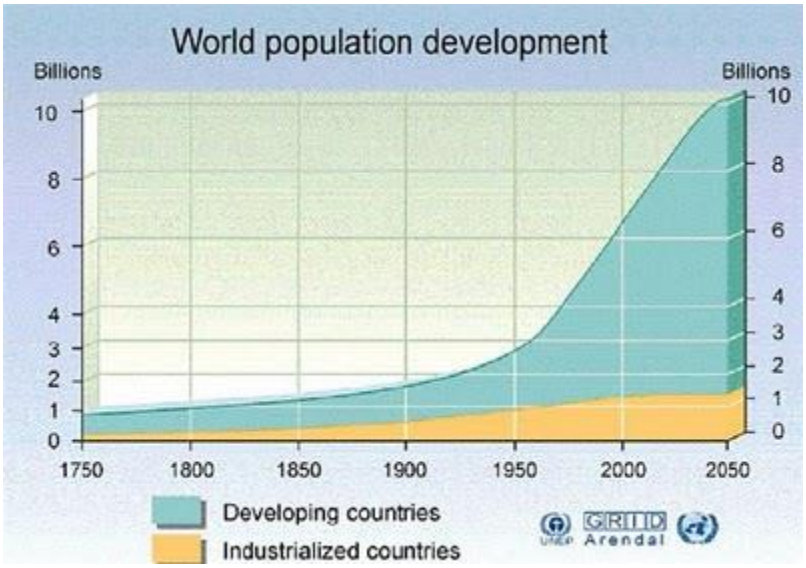
As population growth was increasing in its record breaking velocity, nature was still in its basic elements. As Hegel pointed out in his treatise The Phenomenology of Mind; that air, water, Earth, zones and climate are universal elements of this sort, which make up the indeterminate simple being of natural individualities, and in which these are the same time reflected in them. He surmises that neither individuality nor the natural element is absolutely self-contained. In

their seemed independent detachment, which by observation has an assumption toward one another, all things stand at the same time in essential relation to one another? Further, their relationship to each other stands in such a way that their independence and mutual indifference form the predominating feature, and only in part become abstractions. Nature is divine in its essential being. (Hegel, 1967) Through analogy, he goes on to be explicit as to the roles of the elements of nature as they relate to themselves as humans and to itself as nature. "Air is the unchanging factor, purely universal and transparent; water, the reality that is forever being resolved and given up; fore, their animating unity which is ever dissolving opposition into unity, as well as breaking up their simple unity into opposite constituents: Earth is the tightly compact knot of this articulated whole, the subject on which these realities are, where their processes take effect, that which they start from and to which they return." (Hegel, 1967)

6.8 1900 Population Reached 1 Billion, Population Now Passes 7 Billion

At the turn of the 20th century, there were 1 billion people on the globe, a significant increase from the 17th century yet a mere shadow of the way population numbers were going to grow by 2015. Now the globe is surpassing 7 billion people. Can the world sustain its current population, let alone billions more people? Can this world manage this fast pace of population expansion? Can this world feed its people in the decades and centuries to come?

During the last generations, mankind has made significant advancements in the natural sciences. Populations are exploding in the emerging countries of the globe, as illustrated in the graph below.



6.9 Destroying Nature's Abundance

In his book Collapse, Jared Diamond discusses the accelerating rate of the destruction of natural habitats or converting them into man-made habitats, such as cities and villages, farmlands and pastures, roads, and golf courses. Over half of the forests on the globe have been cut down, and the next quarter will be gone within the next fifty years. Deforestation is the cause of the demise of most of the past civilizations.

The Easter Islands is the most extreme example of forest destruction in the Pacific, and in the world. The complete forest of the Easter Islands is gone. All of the indigenous species of forests are extinct. The loss was catastrophic to the inhabitants, as they lost their timber source, losses in wild life foods, and decreasing fertile soils for crops. Deforestation led to significant soil erosion, which depleted the land's ability to provide for its inhabitants. (Diamond, 2005) The food surpluses turned to less and less food sources. Eventually the advanced society of the Easter Islands which are globally known for its wonderful large head art forms became extinct. What was once a self-sufficient and sustainable civilization imploded unto itself. The god like

heads originally symbolized abundance and glory, now sit by themselves overlooking ghosts of a civilization destroyed by greed and mismanagement.

Forests provide us with ecosystem services such as protecting our watersheds, protecting soil against erosion, participating in the water and rain cycles, and providing habitat for most of the animals and plant life on earth. (Diamond, 2005) Wetlands are also a major concern to Diamond. An even larger proportion of wetlands to forests have been destroyed, damaged or converted to other uses. Wetlands are important to us for existing the quality and quantity of our water supply and the importance of fresh water fisheries. One third of the world's coral reefs have been damaged. Large vessel trawling has destroyed much of the ocean floors. (Diamond, 2005)

7.0 Modern Notions of the Nexus and Actions

Can the Earth carry its large and migratory global population?

More and more data show that humans are not living within the ability of the Earth to carry the planet. The environmental footprint measures human consumption in terms of the biologically productive land needed to provide the resources, and absorb the wastes of the average global citizen. In 2008 it required 2.7 global hectares per person, 30% more than the natural biological capacity of 2.1 global hectares, assuming no provision for other organisms. The resulting environmental deficit must be met from unsustainable extra sources and these are obtained in three ways:

1. Embedded in the goods and services of world trade;
2. Taken from the past as with fossil fuels and minerals;
3. Or borrowed from the future as unsustainable resource usage such as over exploiting forests, minerals and fisheries. (World Wild Life Fund, 2008)

The general trend is for higher standards of living to become less sustainable. As discussed above, population growth has a marked influence on levels of consumption and the efficiency of

resource use. The Nexus goal is to raise the global standard of living without increasing the use of resources beyond globally sustainable levels; that is, to not exceed our own planet's ability to provide for our consumption.

In his Collapse of Easter Island, Professor Palanisamy Nagarajan stresses the unabashed liquidating of finite natural capital on a global scale at an unprecedented rate, which is causing irreversible damage on the global ecosystems. (Nagarajan, 2006)

The study and practice of any economic law or policy which appears to make industry work simply because of cheaper and more efficient production of raw materials or energy is superficial. The availability of cheap energy and raw materials has but a finite life span. Furthermore, its extraction is disruptive to nature. Its diminishing availability requires the development of new, more sustainable energy sources as the peak oil realization becomes final. (Hall & Klitgaard, 2006) Oil and other fossil fuels are not sustainable, as their resource is finite and diminishing by millions of barrels per day.

Just as the opening up of the new world in the 1500s saved the populations of Europe, cheap oil has been the over-riding factor that has allowed humans to ignore the environmental environment's demise. The global economy is based on cheap fossil fuels. Yet, the true cost of extracting fossils is not being factored into our purchase prices. If we had to pay for the full value of the production of fuel, the value to society or replacement costs that nature could charge as a result of the destruction of parts of nature itself, including the shipping and the military related expenses, then the world economies would change dramatically. (Hall & Klitgaard, 2006)

In order to sustain our economic systems, a gradual change in production and consumption patterns must occur. Otherwise, when peak oil has run its course, and there are no substitutes

well in place, the economies of the world will grind to a halt.

Nature's ecosystems are designed entities that interact to build a biological structure that captures and uses available energy. (Brown & Hall, 2004) The organism's programmed DNA promotes the capture, re-configure and use of energy in its specific life. Energy is the important component in order to generate biological structure, which is constantly evolving and replicating itself by way of natural selection. Obviously, there are many similarities between the environmental economies and the human economies. An analogy can be used to compare human cities to a plant. Though cities contain many times more mass, both abiotic and animal mass than that of a plant system, energy is required in both to create and exist them. Solar energy input is required in both systems, but the use of massive quantities of fossil fuels and energy intensive materials are required in cities. The environmental footprints that this major forms of concentration are a major focus of ecologists. (Wackernagel & Rees, 1997) Just as energy produces life and sustains life, it also produces wealth. If we cannot sustain the energy source, we cannot sustain life or wealth. This dilemma is especially true on island states, as most islands do not have their own independent sources of fossil fuels. Islands are particularly vulnerable with the depletion of the global supply of fossil fuels.

7.1 The Rebound Effect

Do technological efficiencies and innovation improvements with the energy using products and systems of our world lead to lower energy consumption, which may in turn reduce our environmental footprint? Do technological innovations assist in our quest for the Nexus?

This question has been explored as far back as the mid eighteen hundreds, when Stanley Jevons argued that improved efficiency in coal use would not lead to a reduction in national coal consumption, but it would rather lead to an increase in coal consumption. (Jevons, 2005) He

believed that with every improvement of coal technology there would be an acceleration of the consumption of coal. Yet, by introducing constant innovations to energy consumption, savings which do in effect get created are then redeployed into the spiral of living standards consumption. Reduced carbon emissions are actually increased by the further spending on lifestyle goods and services. (Herring & Roy, 2007) This is explained with the Rebound Effect. The Rebound Effect is the extent of the energy saving created by the more efficient technology which can be used by the consumer by higher consumption of the same service, or the deployment of their saved capital into the purchase of other goods. Creating a more energy efficiency home requires the spending of capital to re-wire, install new lights, construct better insulated walls and ceilings, create solar or geothermal energy sources, all requiring the investment of rebounded capital that is theoretically saved by more energy conservation.

For centuries, island dwellers were hit with numerous hurricanes per year. After a hurricane, they were forced to re-build their homes and buildings.

In the Bahamas, all buildings are now built with strong brick without the use of wood. Houses now weather the hurricane season intact. With the technological innovation of imported strong brick, they were able to construct a home structure that was sustainable against hurricanes. The savings that accumulated from not having to rebuild their homes each time they were hit by a hurricane allowed them to purchase more goods and services. Their savings were transferred into more lifestyle purchases. Similarly, when Bahamas islanders were able to build break walls in order to protect their islands from large waves, they created a new level of wealth that allowed them to redeploy their capital into other consumables. Similar to physics, what the islanders saved by way of technological innovations, they were able to spend on other lifestyle

consumables.

Even though the auto industry produces lighter, more fuel efficient cars, consumers have tended toward the purchase of larger SUV cars. Therefore, the net effect of the auto innovations and efficiencies during the past thirty years is negligible. (Herring & Roy, 2007)

Wackernagel and Rees confirm this notion in their 1997 book called Our Environmental Footprint when they postulate that the economic gains from the improved technical efficiency will increase the rate of resource throughput. These economic gains are used for economic advantage. These efficiencies are not used to conserve capital, either human or nature's, or to decrease the environmental footprint.

Rather, these savings created by efficiencies lead to higher levels of consumption. (Wackernagel & Rees, 1997) Innovations and technological advancements in and by themselves do not promote energy management. Personal attitudes must change. Innovations must work hand in hand with our thoughts toward less consumption, and less depletion of resources.

7.2 Dematerialization and Small Island States

The era of telecommunications and dematerialization have assisted island populations, as they are now working with energy efficient computers in the banking and investment businesses. Their tax free status has attracted many global trading companies to account for their businesses through island jurisdictions. Islanders have experienced a surge in the growth of the offshore banking economy.

Offshore banking corporations are financial institutions that transact business abroad or in another country. It is a shell branch or a division of a bank established in an offshore financial center. This setup enables the bank to undertake monetary businesses and international exchange transactions. The offshore banking unit is generally exempted from the regulations of the host

country. Some tax privileges are also provided as incentives for the establishment of the profitable banking institution in that country. To engage in offshore banking, Bahamians need only access to telecommunications networks, computers and customers. The Rebound Effect of this new economic era for islands is the increased consumption of energy to power office lighting and air conditioning. Customers from abroad do not like to go into un-air conditioned offices to visit their funds. Another Rebound Effect is seen by the consumption of high fashion by islanders in order to 'look the part' of an international financier. Increased living standards can be seen in bigger cars, extensive homes, private school education, international travel, and art collections.

7.3 Shifting from Fossil Fuels to a Sustainable World

A shift from fossil fuels, whether by choice or as fossil fuel supply runs out, requires and examination of other renewable sources of energy. Solar energy is totally sustainable, renewable, non-toxic, non-obtrusive, and releases no carbon into the atmosphere. All energy is derived from the sun, yet all energy forms are not renewable.

Flexible, light-weight, thin film solar cells developed by my company, Solar Bancorp Inc., (www.solarbancorp.com), offer next generation innovations in technology that can produce energy on a jacket, a car roof, a cellular phone, a briefcase, on clothing, buses, trucks, trains, golf carts, and windows. Solar energy has been hitting the Earth for many billions of years. Without it there would be no life, no energy, and no nature. Harnessing the power of the sun has been the secret of nature's ultimate longevity. By adopting nature's principles, humans can also enjoy the longevity currently enjoyed by nature by maximizing its web of life through logical networks of energy and material flows. (Capra, 2004)

Like often happens, a new industry is quickly evolving to participate in the demise of the first industry. The seafood industry's protein manufacturing capacity has greatly diminished over the past 25 years. The aquaculture industry is responding to the depleted resources of sea-based fish protein by expanding rapidly in order to meet demand. Here we witness that a bad thing (over fishing) has created a good thing (aquaculture) which has created a bad thing. Unfortunately, fish farming largely depends on fish meal in order to feed their fish.

One of the fish that is harvested is found in the southern seas of Antarctica. Krill-based fish feed, and the enzymes and chemicals that are derived from krill, are included in a number of dietary and medical products. The fish industry invested heavily and continued to accelerate its transition toward larger and more technological advanced ocean vessels to harvest and process krill in the Antarctic. For example, a Norwegian company, Aker Biomarine, invested in upgrading its fleet in order to harvest and process more krill. In the first half of 2010 it produced 8,600 tonnes of krill meal for the aquaculture market, up from 6,200 tonnes during the whole 2009 catch season. The total krill catch this season is expected to be 150,000–180,000 tonnes, exceeding last year's total by about 40%. (Schiermeier, 2010) Is this rate of krill fish extraction sustainable?

There are and will be plenty of challenges as we try to pull ourselves out of a centuries old cycle of unsustainable over production and over consumption, and a society that thinks very little of the unmanaged and un-recycled waste that it creates.

7.4 Importance of Education

Living with nature is a constant process of learning, listening, reflecting, nurturing and evolving the network interplay so that balance are the constant outcomes. Home designs will incorporate sustainable green technologies, to generate and retain heat and cool, as well as generate

electricity. We can use this model to better understand our own future environments.

8.0 Renewable Energy, the World's Energy Provider

Today, as a result of the Kyoto Accord and the many self-evident examples of climate change, we are working to re-learn how to live sustainably. Unfortunately, much of 21st century consumption is focused on lifestyle advancements and new forms of gadgets. Nature knows how to sustain itself, so we must learn to listen to nature. New gadgets are not necessary. Using the sun through solar panel energy conversion, and the wind through turbine energy conversion, emits no carbon footprint. Renewable energy is clean, pure, and free. Using natural gravel filtration to clean water is an old natural method of creating drinkable water.

How much sunlight actually can be used? Can it totally replace fossil fuels?

To date, solar power is the purest form of renewable energy known to scientists. Can solar power replace fossil fuels? The answer to this question, when considered alongside how efficiently we can convert raw sunshine into usable power, helps determine whether or not it is realistic to consider solar energy as a viable alternative to conventional energy sources.

Through scientific research, we learn that about 100 watts of solar energy per square foot from the full impact of the sun, hits the Earth. If you assume 12 hours of sun per day, this equates to 438,000 watt-hours per square foot per year. Based on 27,878,400 square feet per square mile, sunlight receives a significant 12.2 trillion watt-hours per square mile per year. Taking this further, 12.2 trillion watt-hours converts to 12,211 gigawatt-hours, and based on 8,760 hours per year, and 197 million square miles of earth's surface including the oceans, the earth receives about 274 million gigawatt-years of solar energy. This amount of sunlight translates to 8.2 million "quads" of Btu energy per year. (EcoWorld, 2006)

A quad Btu represents one quadrillion British Thermal Units of energy, a term used by energy economists. The entire human race currently uses about 400 quads of energy in all forms per year. Therefore, the solar energy hitting the earth exceeds the total energy consumed by humanity by a multiple of over 20,000 times. As a result, converting from fossil fuels to solar energy is achievable. Clearly there is enough solar energy available to fulfill all the human race's energy requirements now, and forever. The key is to develop technologies that efficiently convert solar power into usable energy in a cost-effective manner. This is the goal of companies like my own Solar Bancorp Inc.

8.1 Leading By Example

Some political leaders are setting the new era by way of example. President Obama's recent decision to go solar will provide an additional boast to the solar industry, as well as add value to the sustainable Ecodesign movement. President Obama's recent announcement to use the roof of the White House for the generation of solar powered hot water as well as photovoltaic electricity is demonstrating to the world that he is prepared to lead by example. (Hartford Business, 2010) This enterprise highlights the growing awareness of the alternatives available to non-sustainable fossil fuel sources. Solar panels have no toxic spills, no on-going extraction costs, no on-going transportation costs, and no on-going fuel expenses. Renewable energy also takes the pressure off of energy security challenges that have faced North America for decades.

Once the purchase price of the solar system has been paid back by energy cost savings, it is conceivable that a family can have 35 to 50 years of free energy for their home, no matter how high the cost of electricity grows. By installing solar energy on its rooftop at the White House, President Obama is sending a powerful message to the world that solar energy is clean, renewable and a powerful solution to the many environmental, energy and employment issues

facing the United States.

In a recent interview, Sir Richard Branson, the founder of the Virgin Group of Companies, stated that Oil may reach $200 a barrel without new sustainable energy policies. Branson predicted that there will be an unbelievably painful economic slump if governments do not do more to encourage renewable energy as an alternative to fossil fuels such as oil. He believes that unemployment will reach record levels. (Branson, 2010)

For centuries, man had the ability to extend his reach into new territories of then yet uninterrupted and environmentally sustained lands. New technological advancements accompanied him as he dug deeper into uninhabited lands of the new world. Technology advancements of weapons, transportation, farming, health and geography, kept man's focus on quantitative exploits not qualitative environmental management.

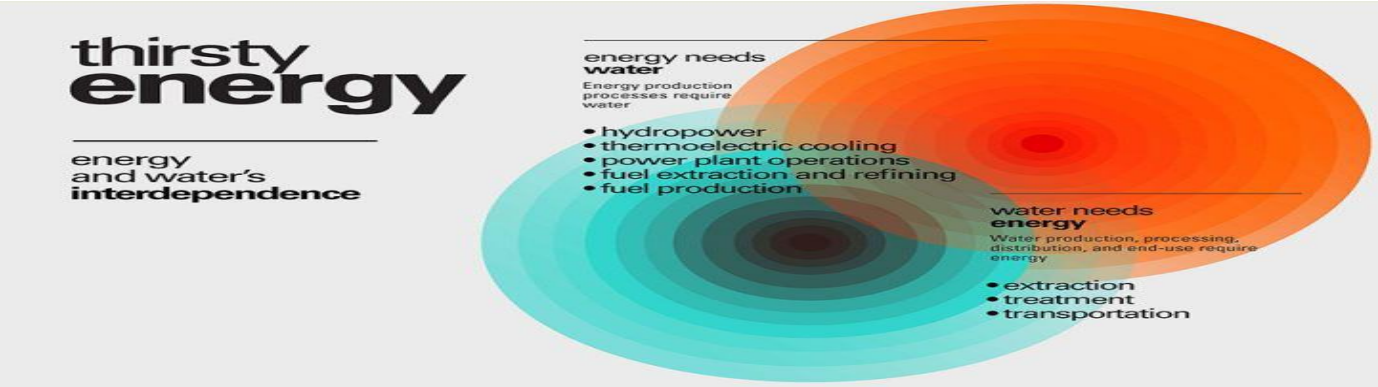
As time went on, population needs continued to increase in the old countries as well as the new colonies. Man had populated most of the globe by the 20th century, and has surpassed 7 billion inhabitants. The 20th century lacked new lands to migrate to, which in turn has created a situation where the Earth can no longer manage the demands placed upon it.

Now is the time to involve everyone in a sustainable way of life, otherwise we will deplete all of Earth's resources and destroy all that we know and enjoy. Business and political leaders such as Bill Gates, Warren Buffett, Richard Branson, and Barak Obama, have assisted this challenge by channeling personal and country capital into research and development in order to advance new renewable energy technologies. Yet, the responsibility of creating a sustainable globe does not rest solely on their shoulders. This task is for all inhabitants to participate, for all inhabitants to contribute with significance and for all inhabitants to take action through proactively managed

lifestyles. The notion of managing the Nexus becomes an active ingredient and participant in each decision that humans make.

8.2 Water Facts

Freshwater use grew more than twice as fast population in the 20th century–its nine-fold increase ranked closely behind the thirteen-fold increase in energy as an economic resource. Today, freshwater resource depletion and population growth from 7 to 9 billion by 2050 make this trend unsustainable. Over 3 1/2 billion people in some of the densely populated and poorest parts of the Middle East, Africa and Asia are projected by 2025 to live in countries that cannot feed themselves. Water availability per person in the already bone dry, combustible Middle East is expected to halve by 2050 due as regional population swells by over 60%. Growing clashes are also foreseen between food and energy, an intensive water user, as global demand for energy grows by 45% by 2030. (Coto, 2013)



(Revolve Water, 2015)

Environmental refugees from drought, floods, storms, and other climate change-induced water shocks, are expected to multiply from today's 25 to 50 million to 150 million within a decade. Over 1.1 billion people today lack access to safe drinking water; 2.6 billion two-fifths of

humanity lack adequate sanitation. Because water is heavy–8 1/3 pounds per gallon or 20% more than oil—a household of four often needs to fetch at least 200 pounds of water each day in order to survive. The planet's drylands, home to one third of humanity, have only 8% of the world's renewable, accessible water supplies. Water is a huge comparative advantage for America, which has five times more freshwater per person than China, and six times more than India. (Coto, 2013) As much as one-fourth of global freshwater use may already be exceeding accessible, sustainable supply. Some 70 major river systems are almost totally drained, groundwater tables levels are plunging, and mountain glaciers vital to re-stocking freshwater flows are shrinking worldwide.

Despite its scarcity, water is the most undervalued and wasted critical natural resource. Irrigation consumes over two-thirds of the world's water, but half the water in traditional flood irrigation never ever reaches the crop roots. Major cities lose up to 40% of their water to leaky, old urban infrastructure. (Coto, 2013)

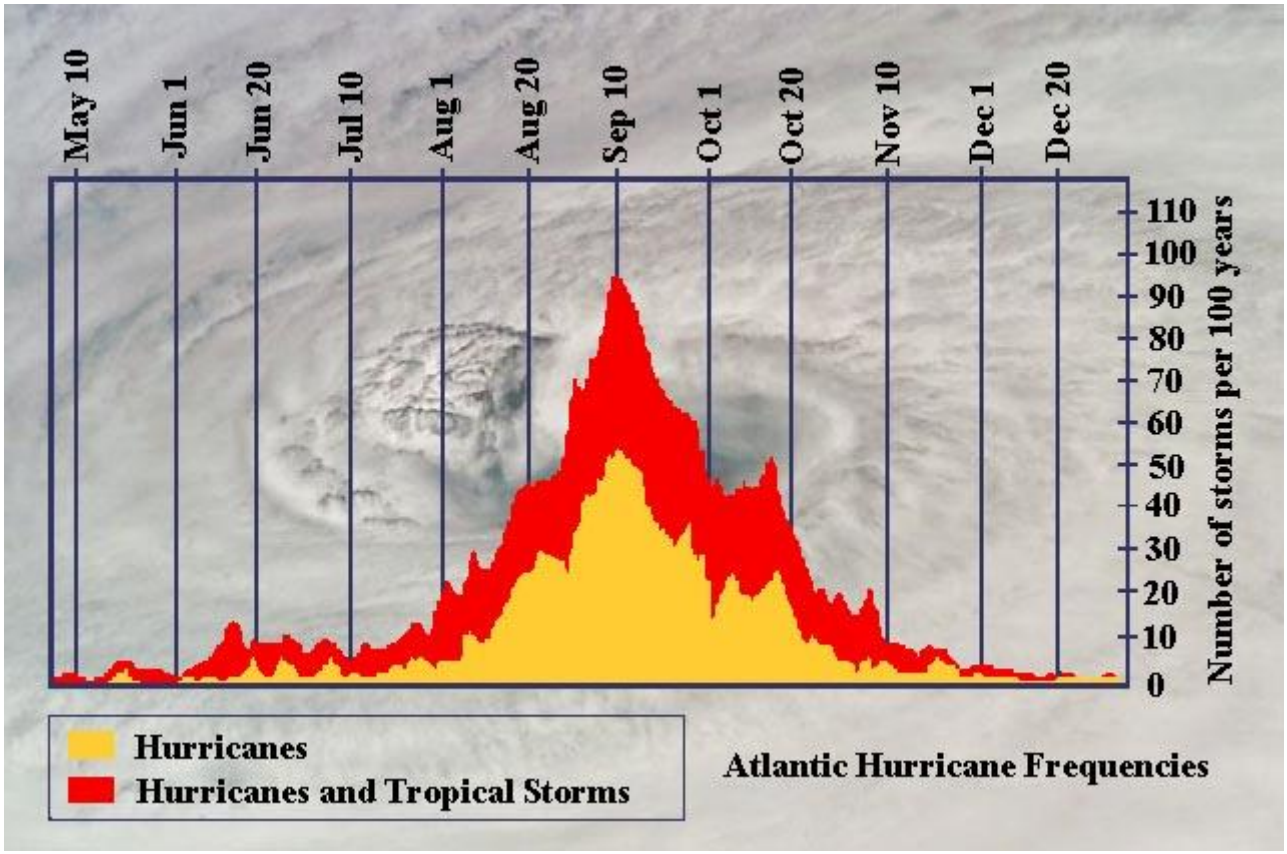
Only 3% of the Earth's water is fresh; of freshwater, only a miniscule 1/3rd of
1% is in the accessible, liquid form on or near the surface that has sustained all civilizations throughout history. One hopeful sign is that, thanks to efficiencies, water use has started to decline in the industrial democracies. U.S. water usage per person has dropped by 30% since 1975.

8.3 Climate Change, Hurricanes are a Reality in the Bahamas

80% of the Bahamas lies 1 meter above sea level. In the Bahamas, the residents experience five to eight hurricanes per year on average. Hurricane Sandy is also still fresh in the minds of many residents of the Bahamas as the largest hurricane recorded in the Atlantic.

Sandy prompted an evaluation of water, sewer, and storm water systems. In New Jersey, the

super-storm caused the state to spend $2.6 billion in repairs. The hurricane damaged over 100 drinking water facilities and sewage plants were damaged. The damage was worsened because of chronic underinvestment in infrastructure… especially for drinking water and for wastewater, which are reportedly in need of around $45 billion in investments over the next 20 years. (Sprott, 2013)



(Wunderground, 2014)

For example, In New York and New Jersey, the storm caused 11 billion gallons of raw or partially untreated sewage to flow into the water supply. The sewage treatment plants were rendered inoperable.

Water systems throughout the Caribbean and North America simply were not adapted to the events that unfolded. If we see more of this kind of extreme weather activity, it will require more innovation and capital to meet the challenges.

In contrast to excessive precipitation caused by hurricanes in the Caribbean, a severe drought is occurring as I write in the western states. California has declared a "Drought of the Century" as rainfall is at less than 20 percent of normal and reservoirs are dwindling. (Sprott, 2013)

When changing, and more extreme, weather patterns hit water management systems that have been unchanged for decades, even centuries, adaptation is needed. Arizona farmers have already begun to implement water conservation measures.

They deploy laser technology in order to diminish runoff and keep field tables flat. Nevada has created a closed loop system where water from Las Vegas is recycled and returned to Lake Mead. California recently broke ground on the largest desalination plant in the Western hemisphere. We should expect more sophisticated, resilient, and dynamic water management schemes to evolve. Yet the current thinking from the government is less than stellar. The Bahamas Environment, Science and Technology Commission in April 2001 reported that policy options available to The Bahamas to respond to climate change are limited. The Small Island States of the Caribbean lack fossil fuel commodities, so must depend on the fluctuating spot market for pricing as well as availability from foreign markets to source. The future for most Small Island States such as the Bahamas is uncertain because they often lack fossil fuel resources, indigenous science and technology capability, and they must depend on imports of technology. They also lack any real adaptation options other than abandonment, retreat, or accommodation to climate change. Our initial review of the vulnerability to climate change in The Bahamas is rather negative. Without clear policy and the migration toward renewable energy technology, it can be expected that fuel imports and GHG emissions will to rise as the population grows and the demand for energy, in response to climate change, increases. (First National Communication on Climate Change, (2001))

8.4 Water Safety Services

Recycling water for human consumption is an advanced field, and technology has allowed us to enjoy cheap, safe, and plentiful water for drinking, washing dishes, or brushing teeth. Pathogens and chemicals in the water are a serious danger to humans, and there are several new technologies that take advantage of the demand for high-quality water for human consumption. (Sprott, 2013)

The next generation of water systems is already deploying monitoring devices that will track multiple points for abnormalities and have the ability to immediately halt the flow in order to investigate and remediate a potential threat. Nanotechnology sensors among other technologies are being used to identify problems that arise in order to quickly report them to an operator. So we should look to improvements in technology and infrastructure to protect the quality of drinking water, especially as weather patterns change, investments in infrastructure and technology to guarantee water safety could be another big trend.

8.5 Storm Water Management

Most people don't consider the impact of storm water on urban areas, but rain that falls on urban areas can become an issue. Because urban areas are covered with mostly impervious surfaces (like roads and parking lots), the amount of water that seeps into the ground is decreased. The water tends to go into nearby streams and channels, which can cause flooding and massive erosion of water beds. On top of that, the runoff water often contains trash, oil and rubber from cars, as well as fertilizer and pesticides from lawns and agriculture, and other pollutants.

8.6 Public-Private Partnerships for Water Development

Although countries dominate the investment picture for water, public-private partnerships have emerged that could allow some investors to take advantage of the need for systems to handle

storm water runoff.

Financial arrangements where water users pay for the services provided by storm water management structures could be the model for dealing with this issue. Systems for managing, treating and distributing water are subject to change. Soon, they could be forced to adapt to irregular weather patterns caused by climate change.

Modifying and upgrading existing structures, providing safe water for human use, and solving the problem of storm water runoff in urban areas could be a few big trends in water investing to look out for going forward. The highly-politicized water markets in the Caribbean and North America are broken and extremely inefficient. The added stresses of weather events such as droughts exacerbate water supply issues to our most critical industries. Water is becoming a scarce resource and there is money to be made by the companies with rights to water resources and the distribution networks to provide it. Water utilities have an excellent dividend paying policy. Per capita water consumption is rising, which causes the dwindling supplies of water. The public thirst for knowledge is escalating water quality awareness. The aging, deteriorating, water distribution infrastructures. Private – Public water projects are growing.

Two boys sit on a water supply pipe over a polluted canal while filling a container with drinking water from a leak in the pipe in Noida, Uttar Pradesh, in 2011. REUTERS/Parivartan Sharma

8.7 Water Technology Solutions

Can there be quick, solution-driven action implemented minute by minute?

The 2013 World Water Week together with the Stockholm International Water Institute (SIWI) called for th0e U.N. to make water a central focus of the post-2015 global development agenda. The Stockholm Statement, the result of a consultation process before and during the main global meeting on water and development, said that since water is at the core of sustainable development, a dedicated goal on water is necessary for a world where all people can live in safety and dignity. (World Water Week, 2013)

By the year 2050, water demand is projected to increase by 55 percent, while food demand and energy consumption are projected to increase by 60 and 80 percent respectively.

Using water more productively and efficiently is critical to meet the growing demand.

Currently, 783 million people still do not have access to clean water, and almost 2.5 billion do not have access to adequate sanitation. (World Water Week, 2013)

In addition, as water-related disasters are among the worst and most recurrent, to achieve sustainable development exposure to water-related risks need to be lowered.

In the year declared by U.N. General Assembly as the "International Year of Water Cooperation", World Water Week focused on building partnerships, and experts all but agreed that in order to achieve sustainable development, adequate water governance and cooperation between actors in different sectors will be crucial.

In more than 100 seminars, workshops and events, more than 2,600 participants from governments, private sector, multilateral organisations, civil society and academia debated the most pressing water challenges of our time.

The Stockholm Statement called for the following goals to be achieved by 2030:

Doubling global water productivity: Growing populations and economies, coupled with urbanisation and climate change, exert mounting pressure on water resources all over the world. To meet the demand, there is great potential to use water more productively and derive significant benefits from cross-sectoral coordination. (World Water Week, 2013)

Realising the right to safe drinking water and sanitation: Women and children often carry a disproportionate share of the burdens of water provision and lack of safe sanitation, with serious repercussions on their health, security and education, as well as their opportunities for development and prosperity. Political leadership and innovative governance are of critical importance to the realisation of this human right.

Increasing resilience to water-related disasters: Comprehensively managing risks, sustaining healthy ecosystems and improving water quality are prerequisites for the provision of safe water, food, energy and other basic needs for people and societies in the future we want.

8.9 Davos Conference

Can we assume that nature is amply represented by water, food and energy; and if we further accept that these three vitally important elements are inter-connected within the world as necessary component premises for the balance, well-being and future prosperity of the world; then we must describe the current state of the global natural landscape, with specific focus on the ever-growing risks associated with the geopolitical landscape; and to conclude by offering suggestions for a workable and balanced Nexus for our future survival and prosperity.

This paper is not the first focus on the challenges that the risks present. Four decades ago, the inaugural meeting of what would later become the World Economic Forum Annual Meeting was held in Davos, Switzerland. This annual forum has outlined some of the top issues most likely to

come to the fore of the global risks geopolitical landscape. They have stressed the need for a multi-stakeholder approach to address them. Intuitively, we know that global risks do not manifest themselves in isolation, but come into existence either geographically or in time as a result of an imbalance with nature caused by human activity. This fundamental premise is well illustrated by the recent 2008 – 2009 financial crisis as well as the devastation caused by nature in Japan, and the associated nuclear reactor destruction that resulted after the earth quake. We are experiencing a world with unprecedented levels of interconnectedness between nature and mankind, and are becoming aware of many areas of risk as a result of this inter-connectiveness. At this critical juncture, the need to redress imbalances, change incentives and improve global understanding and cooperation remains the top priority if future challenges are to be met with the right solutions and sufficient levels of preparedness. We believe that these risks inherent in the relationship between nature and man can only be addressed by a fundamental overhaul of current values and behaviour. The effects of these risks will not only be felt over the coming near-term, but will also influence decision-making well into the new decade. Inherent to these problems is the fact that they concern stakeholders from all verticals and regions across the world, involving the multi-stakeholder aspect of global risks. Due to the global reach and interconnectivity of risks, it renders it more difficult to manage effectively.

Through our analysis of the interconnectedness between nature and mankind, we will better understand the potential risks that loom close, which emphasizes the need for more effective global understanding to unlock the resolution of many of the issues highlighted in this paper. However, to succeed, these resolutions will need to be supported by participants willing to reconcile often diverging agenda and able to address the long-term structural issues at hand as

well as the immediate problems. We will also need to consider the direct and indirect social implications of our policies. Legitimacy, accountability, clarity, concerted action, and nature's supreme survival: these are the operative words of efficient global risk management and effective global governance. (World Economic Forum, 2010)

9.0 2015 Risk, and Beyond

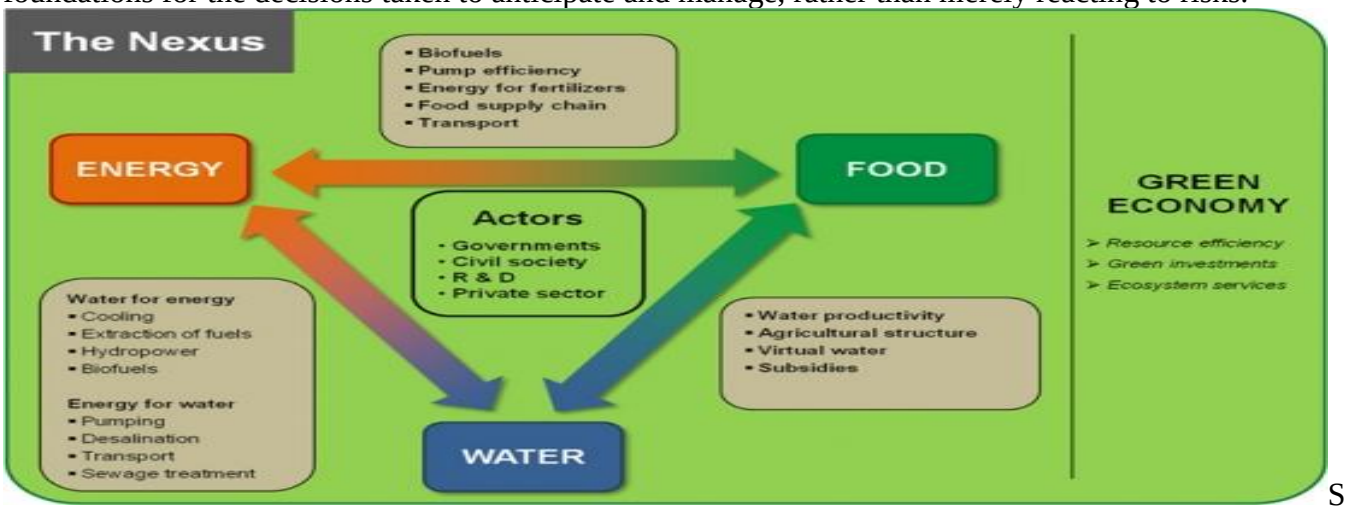
As I write this paper it is now 2015. We have had activities during numerous millennia to create and cause imbalance on the landscape. The risk to our social and natural landscape is even more complex than in the past. We must urge a consideration of the longer term, global implications of risks in areas beyond their immediate and obvious implications. These risks must be addressed collectively so opportunities can be found in their complexity.

With the recent shocks of tsunamis, earth quakes, record-setting oil prices, gold and other commodities breaking records, and the financial melt-down of 2008, 2009 and into 2010, we have been given many global events to motivate our reflection, appraisal and direction adjustment. This nature imposed pause and reflection has allowed a higher level of recognition that global risks are now tightly interconnected and shocks and vulnerabilities are truly global, even if impact and response can still differ at the local level. (World Economic Forum, 2010)

The events of the past few years have shown how costly ineffective failures can be when they erupt in systems. The lessons learned were numerous but must be remembered and acted on in other areas, not only in the sphere of finance and economics resulting from the melt-down. Much discussion has rightly centred on behaviour change and governance, but both are highly dependent on political and individual will and the choices acted on by decision-makers. For behaviour to evolve, a concerted effort is needed to provide the right mix of information, incentives and institutions; to stretch people's time horizons and make them understand exactly

what is at risk here and now, as well as into the future.

All of this requires a longer term approach than usually dictated by electoral cycles or indeed financial reporting, Twitter feeds, Internet social networking and executive tenure. We must manage the complexity and risks of global growth and well-being. This will take time to create the sustainable model. Unfortunately, time is one commodity that we are running out of. Our global population is growing daily, and its needs are growing as well. Yet, taking strong steps week by week, will hopefully create and strength strategies and policies which will form the foundations for the decisions taken to anticipate and manage, rather than merely reacting to risks.



Source: http://www.water-energy-food.org/en/bonn_2011_process/show__12_water_in_the_green_economy.html

Finding common solutions for the three sectors is of major importance to creating a green economy that can act in the areas of resource efficiency, green investment and ecosystem services. The first task for the experts, however, is to work out how sustainable and cross-sector management of water resources can contribute to environmentally sound growth and efforts to combat underdevelopment and poverty. The results will then be translated into concrete solutions and strategies and brought into the international discussion.

The receive theme discussions of food vs. fuel concerns makes up one subset of this much larger

and more complex set of interactions of water, food and energy. These can be further expanded by incorporating the relationships between this triad and climate change. To imagine that we can tackle the climate change challenge in light of our lack of success with major challenges such as energy security and the ever-increasing deficit and debt risks of the developed world, leads one to question previous method and tactics.

The extra complexities resulting from adding water to the already thorny food-fuel relationship, shows food security, water security and energy security linked by a series of sometimes reciprocal inputs, and influenced by other factors such as population and energy growth and environmental pressures, along with two overarching risks of global governance failures and economic disparity. All of this leads toward geopolitical conflict. (Stiles, 2011)

Renewable energy technology has evolved to the point where solar panels can and do now produce sufficient energy to power hundreds of thousands of homes. Yet, the systems are not available to every household. How do we get to cleaner and more productive energy systems that are sustainable and accessible to all?

Renewable technologies are particularly well suited for island states, which are currently fully dependent on diesel fuel purchased from outside of their jurisdiction to create their electricity. With higher fuel costs growing by the month, island states such as the Bahamas and Jamaica are very venerable to fossil fuel supply and demand price swings.

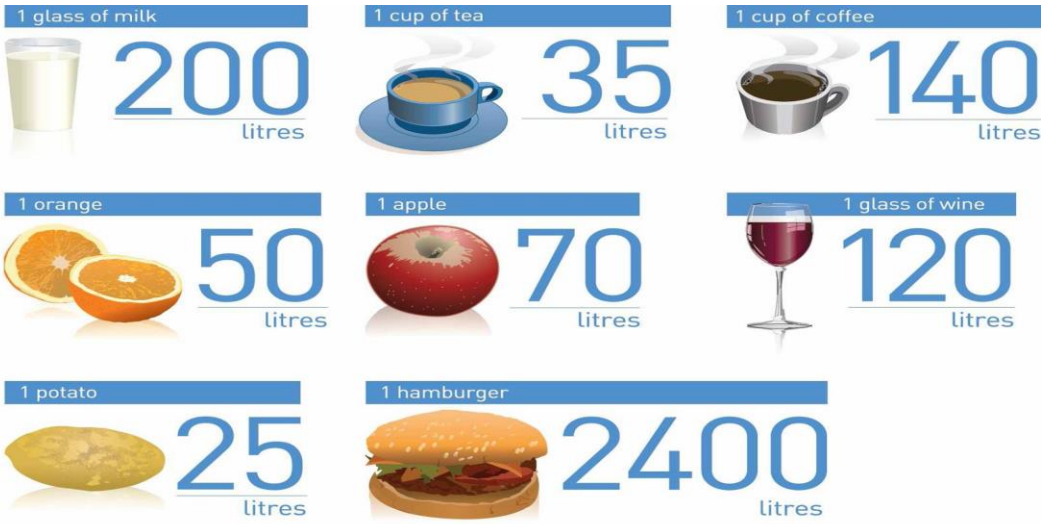
The average North American person is not yet motivated to conserve water. This average person does not know critical data on the supply side of an emerging water crisis. In his 'Energy, Water, and Food-Scenarios on the Future of Sustainable Development', Gerald Harris tells us that global consumption of water if doubling every 20 years, twice the rate of human population growth, while about 10% of water use is household use, 20% to 25% is industrial use and the

remaining 65% to 70% is for irrigation for agriculture. Particles of human produced pollution may be weakening the hydrological cycle as they cut down on the amount of sunlight reaching the oceans. The resulting reduction in heat means that less water evaporates back into the atmosphere, and thus less rain. Extensive pump extraction of groundwater is a phenomenon of the late 20th century because of the availability of electricity and inexpensive equipment.

9.1 Water Risk

In order to deal effectively with the global risks of water, food and energy, the world's largest countries must not act in a unilateral or is isolated manner. Environmental degradation all would agree is a global risk issue. No matter what pollution regulations are enacted in the United States, if other countries destroy the ozone layer, America will suffer the effects along with everyone else. (Chua, 2007)

How Much Water does it Take to Produce these Consumer Goods?



(Lafayette, 2015)

With the movement of goods and services internationally, disease cannot be dealt with by one country alone. Islands are particularly vulnerable to the spread of disease in food; because many

islands do not produce their own food stuffs.

The Bahamas does not have the much needed top soil, in order to grow their own fruits and vegetables. Therefore, most of their foods came from offshore. (Beatty, 2001)

Famine and genocide in far-away countries can have spill-over effects, with the possibility of tens of thousands of refugees fleeing across borders into islands or other countries. The major countries should pursue bilateral or unilateral agreements with like-minded countries and create new international institutions. (Chua, 2007)

Creating a sense of affiliation and common purpose can strengthen relationships globally. The green revolution can create an investment opportunity that has never existed. Companies are striving to create their green brand, because their customers are insisting. Countries should also strive for the same brand awareness, because their citizens are demanding it.

For water the big issues in most places are clear: will there be enough, at what prices, thus what impacts on food prices? Also, what will be the toxic effects of fertilizers and pesticides on rivers and groundwater supplies, and who will bear those costs? Energy is used in many forms in agriculture and food production, from tractors and trucks to electric power driven food processing equipment. In much of the world human and animal muscle power are the primary energy sources, with their inherent limitations. The issue is not only a constraint in the supply of energy but its relative price to grid parity compared to other inputs. In poor countries and many islands, where oil, fuel, and electricity are costly, the only choice is muscle power. Eventually, as energy technologies change and costs shift, how energy is used in agricultural processes will evolve in both developed and underdeveloped countries. As evidenced in the developed world, energy gets cheaper it will replace muscle power and increase the quantity and quality of food in developing countries and islands. (Harris, 2002)

9.2 Food Risk

But even with today's water and energy challenges in agriculture, it is widely agreed that there is no shortage of food in the world. Hunger and starvation occur because of the failure of our distribution systems. Our distribution systems fail for a number of reasons, mostly because of the economic and political rules they follow. Economically (in a market system) if the price food can be sold for is less than the cost of production and delivery, then some subsidy must be in place to cover the difference. In developed countries governments provide these subsidies. For example in the U.S. every bushel of corn currently has a $.50 subsidy. (Harris, 2002)

Very often these subsidies can lead to abundant production that leads to lower market prices. Unfortunately in war-torn Africa, we see the most common uses of food as a political weapon. In places like the Sudan food has been used as a weapon to literally starve enemies to death. War also makes it hard to plant and harvest food and thus leads directly to starvation. (Harris, 2002)

In most local environments, without wars and drought, food production can be managed to meet local needs. Mankind has been at food production for centuries and has mastered it: from high quality seeds, knowledge of soils, use of fertilizers, understanding of seasons, and just about anything else one can think of. The challenge in today's world relates to the fact that food is internationally traded. This means local production costs must compete with world production costs. This is where local or national subsidies wreak havoc. Subsidies, like those in the U.S. and European farm systems lead to high levels of production and thus low world prices for many commodities. It estimated that the U.S. farm subsidies in the most recent legislation will deliver $1 billion per day to it farmers. There are strong arguments in favor of this level of support. They include protecting farmers from the vagaries of weather conditions and market prices in order to

sustain a healthy diet for the American people. There is a long history of farmers suffering and struggling with the dual forces of unpredictable weather and unstable commodity prices. The current systems of support were built from years of experience. Similar histories and conditions exist in other developed economies, especially in Europe. Food is not only important for life but also for national security. Farmers in developed countries provide some of the highest quality food in the world at relatively low prices for the average family budget. This is significant (Harris, 2002)

From 1950 to 1984, food production output was growing at a record pace, faster than any other time in human history. (Kennedy, 1993) World grain harvests rose 2.6 times during those 34 years, which was faster than the increase in the world's population. The food harvest basket expanded due to the increasing population and the advancements in machinery, more fertilizer, better irrigation, and crop rotation were introduced to farming across the world. (Kennedy, 1993) Since the intense draughts in USA after 1984, the pace of global agricultural expansion has slowed down considerably. According to the World Watch Institute, increases of 28 million tons of grain each year to keep pace with population growth. This falls short of the annual yields of approximately 15 million tons. This deficit equates to an increasing number of the global population being seriously undernourished. (Brown, et. al., 1990)

How to progress to the next level? Increasing the efficiency of farmers in poorer countries would be a possible solution. In Asian rice fields, up to 40 percent of fertilizers are wasted because of inefficient applications, while poor crop management, food storage, and handling inefficiencies wastes up to 20 percent of all rice grown in Asia. (Johnstone, 1988) The average African farmer produces only 600 kilograms of cereals a year, compared to 80,000 kilograms, or 130 times as much, per agricultural worker in North America. (Kennedy, 1993)

Better training and agricultural education, increase access to markets, better seeds, crop rotation, better machinery, and environmentally sound forestry would go a long way to increase efficiencies. Access to modern farming information is key to the evolution of the Bahamas farming industries.

Selective breeding, better seed ratios, plant-breeding techniques, and modern genetic intelligence will assist the emerging markets to realize their potential at a faster pace.

9.3 Energy Risk

Understanding the unique risks of oil-producing countries is not easy. From political to economic to security risks, there are many and they are far-reaching. According to the U.S. Energy Information Administration (EIA), the world economic recovery is pushing demand for fossil fuels to an all-time high. (U.S. Energy Administration, 2011) West Texas Intermediate crude oil spot prices averaged $89 per barrel in February and $103 per barrel in March, 2014. The price has continued to rise in recent days, reaching $112 on April 8, 2014. Crude oil prices are currently at their highest level since 2008. EIA expects oil markets to continue to tighten over the next two years given expected robust growth in world oil demand and slow growth in supply from non-Organization of the Petroleum Exporting Countries (non-OPEC) countries. EIA projects that the retail price of regular-grade motor gasoline will average $3.86 USD per gallon during this summer's driving season (the period between April 1 and September 30, 2014), up from $2.76 per gallon USD at summer. (U.S. Energy Administration, 2011))

The forecast for total world oil consumption grows by an annual average of 1.5 million bbl/d in 2011 and 2012. Supply from non-OPEC countries grows an average of about 0.4 million bbl/d annually through 2012. Consequently, EIA expects that in order to meet projected demand growth the market will rely on both a drawdown of inventories and significant increases in the

production of crude oil and non-crude liquids in OPEC member countries at a time when the disruption of crude oil exports from Libya and continuing unrest in other MENA countries already highlight significant supply risks. (U.S. Energy Administration, 2011)

Among the major uncertainties that could push oil prices above or below our current forecast are: the continued unrest in producing countries and its potential impact on supply; decisions by key OPEC member countries regarding their production response to the global increase in oil demand; the rate of economic growth, both domestically and globally; fiscal issues facing national and sub-national governments; and China's efforts to address concerns regarding its growth and inflation rates. (U.AS. Energy Administration, 2011) World crude oil and liquid fuels consumption grew by an estimated 2.3 million bbl/d in 2010 to a record-high level of 86.7 million bbl/d. EIA expects that world liquid fuels consumption will grow by 1.5 million bbl/d in 2011 and by an additional 1.6 million bbl/d in 2012. The Organization for Economic Cooperation and Development (OECD) will make up almost all of the growth in consumption over the next two years, with the largest increases coming from China, Brazil, and the Middle East. (U.S. Energy Administration, 2011)

9.4 Pollution Risk

Other, indirect, linkages between energy and water exist as well. Energy production and use produces emissions that can pollute surface and underground water supplies. The ability to move freight via inland waterways impacts the amount of energy required to move our nation’s goods because movement by waterway is much less energy intense per ton than the alternatives of rail and truck. If competing water uses limit use of such waterways, we will use more energy to move our goods and energy security will be impacted. (Hoffman, 2004)

The world's total annual use of commercial energy is on the order of 400 quadrillion BTUs (Quads), and the sun pours about 6 million Quads of radiant energy into the earth's atmosphere each year. What is in short supply is cheap energy, energy that people can afford to buy. Exactly the same can be said about water.

Water, in absolute terms, is not in short supply in the world. The earth is a water rich planet, and annual human and animal consumption is much less than 1% of the world's total water supply. What is in short supply is cheap potable water, clean water that people can afford to buy. (Hoffman, 2004)

In a dynamic and highly populated area such as the Bahamas, pollution levels are a significant concern. Because the Bahamas is an ocean oil-producing area, it is vulnerable to an addition set of complex environmental concerns, including major oil spills. Social and economic stresses in urban or rural, coastal or interior areas are the source of serious environmental problems, resulting in pollution which flows directly into Caribbean Sea, degrading precious water resources. Marine pollution is created by small as well as large vessels. Larger ships use several chemicals in ship building and repair. Most of these activities are highly concentrated in commercial port facilities and can cause complete loss to surrounding marine life. Other tourist facilities increase pollution levels and create more public health problems, ultimately jeopardizing the future of tourism overall. Hotels in the Bahamas have recently been fined for release of high fecal pollution and discouraged tourism for a short time.

Energy and water policy can also be expressed in similar terms. The first priority of energy policy should be the wise, efficient use of whatever energy supplies are available. The same is true of water – priority should be given to the wise, efficient use of whatever water supplies exist. It is after focusing on efficient use of existing resources that attention must be focused on

new energy and water supplies that meet the Nexus and environmental requirements.

The problem is that 96%, or 317 million cubic miles, is found in the oceans and is saline. Another 7 million cubic miles is tied up in icecaps and glaciers, and 3.1 million in the earth's atmosphere. Ground water, fresh water lakes, and rivers account for just over 2 million cubic miles of fresh water. The net result is that 99.7% of all the water on earth is not available for human and animal consumption. Of the remaining 0.3%, much is inaccessible due to unreachable locations and depths, and the vast majority of water for human and animal consumption, much less than 1% of the total supply, is stored in ground water. (Hoffman, 2004)

Oil Oozing out of an Oil Storage Container Beside Clifton Pier, Nassau

(Save the Bays, 2015)

Close Up Shot of Oil Oozing out of an Oil Container, Clifton Cay, Nassau

(Save the Bays, 2015)

An important feature of the earth's supply of fresh water is its non-uniform distribution around the globe. Water, for which there are no substitutes, has always been mankind's most precious resource. The struggle to control water resources has shaped human political and economic history, and water has been a source of tension wherever water resources are shared by neighboring peoples. Globally, there are 215 international rivers and 300 ground water basins and aquifers shared by two or more countries. (Hoffman, 2004)

Water-related tensions around the world can have significant implications for U.S. national security. In the Middle East, for example, water is a source of conflict not only between Israel and its Arab neighbors, but also between Egypt and Sudan, and Turkey, Syria, and Iraq. Many have forgotten that the progression towards the 1967 War, whose impact lingers to this day, was

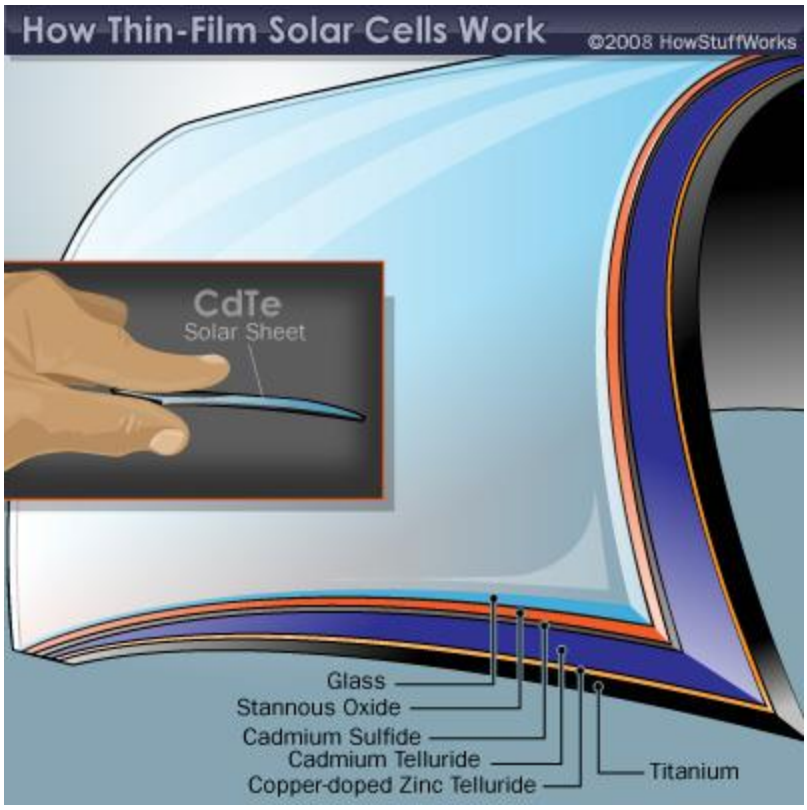
triggered by the water dispute between Israel and Syria over control over the Jordan River. Water conflicts add to the instability of a region on which the U.S. depends heavily for oil. Continuation or inflammation of these conflicts could subject U.S. energy supplies to blackmail again, as occurred in the 1970s.

9.5 Solar Energy Innovation

The challenges of solar innovation are numerous. Currently, the maximum achievable efficiency of single junction solar cells is limited by the inability for any known semiconductor material to utilise the entire light spectrum available under solar irradiation for photo-conversion. Multi-junction solar cell structures consisting of stacks of different semiconductors with appropriately matched band gaps are used to increase the spectral response of the photovoltaic device over a wide wavelength range. The close matching of the current from each solar cell of the stack is imperative in series connected multi-junction cells since the overall photo-current is determined by the solar cell that generates the lower photo–current. (Beatty, et. al., 2009)

However, optical losses from the front and back contacts, various inactive window layers of the cell as well as at interfaces between the layers in the stack may reduce the amount of light reaching the bottom cell causing a current mismatch.

With the Solar Department in Kharkiv's Polytechnical Institute, we analyzed the photovoltaic parameters of the most promising CdS/CdTe solar cells for large application prepared by close space sublimation (CSS) and physical vapour deposition. CdS/CdTe solar cells which have an efficiency of ~10 % have been studied by current-voltage, capacitance-voltage and quantum efficiency measurements.



(MIT.Edu)

The photovoltaic conversion of the solar energy, which is a direct conversion of radiation energy into electricity, is one of the principal ways to resolve the exhausting of our existing natural resources of oil, gas, coil, nuclear fuel and environmental challenges. Of the various alternatives for thin-film PV materials, CdTe is a leading candidate for several reasons. It has a band gap of 1.5 eV, which is very close to optimal for the solar spectrum. It is a simple binary compound that can be deposited as a thin-film by a variety of high deposition rate techniques. It's a low-cost and abundant material. Thin-film CdTe has a relatively low density of extraneous grain-boundary states.

The benefits of this sustainable project include the production of renewable biomass energy, assisting Bahamas Power in meeting its 'clean energy' power obligations; providing an alternative use to land application for animal biomass, assisting animal farmers with the

management of their used biomass and the associated regulatory obligations for nutrient management; reducing the potential for animal biomass to cause nutrient over-loading in groundwater, which can lead to high levels of phosphorus and nitrates in drinking water, lakes and rivers; recycling of the nutrients in the animal biomass, in the form of the fertilizer derived from the ash resulting from the combustion of the animal biomass; reduction in greenhouse gas production through the displacement of existing fossil-fueled generation by carbon-neutral biomass electricity; providing rural jobs in the Bahamas, including highly skilled jobs for operators of the plant and indirect jobs in transportation and support services such as maintenance and engineering; and helping protect animal industry jobs by enhancing the future environmental sustainability of the Bahamas' animal industry.

Similar to Solar Bancorp Inc., GE has announced that a full-size, thin film solar panel developed by the company has been independently certified as the most efficient ever publicly reported milestone for the technology. GE intends to manufacture the record-setting solar panels at a new U.S. factory that will be larger than any existing solar panel factory in the country today. When complete, the factory will highlight an expected $600 million plus investment made by GE in solar technology and commercialization. In addition, GE has completed the acquisition of PrimeStar Solar, a thin film solar technology company in which GE has held a majority equity stake since 2008. Photovoltaic solar is the next step in growing GE's renewable energy portfolio and is part of the company's Ecomagination commitment to drive clean energy technology through innovation and R and D investment. (Power-Gen Worldwide, 2011), Global demand for photovoltaics is expected to grow by 75 gigawatts over the next five years, with utility-scale solar power plants making up a significant part of that growth.

Power electronics are critical to bringing renewable sources such as wind and solar into the mainstream, delivering economies of scale and providing stable connection to the grid.

10.0 Exponential Nearer-Term Population Growth Causing Water and Energy Challenges

For two thousand years, population trends have been recorded in order to best understand demographic change. As the chart below illustrates, the near to mid-term human growth curve resembles a dramatic “J”, whereby the human race is growing at an exponential and probably unsustainable rate. Questions that arise from the notion of exponential growth are quite dramatic. Can the world sustain the ever-increasing population? Can the world’s water supply provide for the ever-increasing population? Can technology produce enough energy to power the industrial needs of the growing population? Can a larger population be fed, given agricultural limitations as it absorbs the impact of climate change? All of these questions relate to all world states, especially smaller island states where water and energy resources are significantly limited.

As we see in the chart below, the human population growth curve is currently following an exponential curve or a "J-shape". Common sense tells us that such growth cannot continue, as the world is a finite structure. Population cannot grow forever. Yet, in the near to mid-term, population is growing at the highest rate recorded. Can the world sustain this growth, before fertility trends begin a dramatic change?

In a recent interview by Jorge Salazar of EarthSky on Oct 30, 2011 demographer Dr. Joel Cohen, Professor of Populations and head of the Laboratory of Populations at the Rockefeller University and Columbia University in New York explained the population trends in a world with 7 billion inhabitants. Many continue to face issues of dire poverty. The population is aging. Seniors now

outnumber toddlers, and this trend will continue to increase. (Cohen, 2011)

During the EarthSky interview Cohen explained that in the last decade, the world passed a very major milestone. And that is that for the first time in history, the number of people 60 years old or more exceeded the number of people 0-4 years old. Basically, for the first time, the grandparents outnumber the grandchildren. In the year 2000, there were about 10 percent of the world's people were age 0-4, and about 10 percent were age 60+. The globe is going into the era of aging. And by 2050, it is anticipated that the number of people 60+ will be about 3.5 times the number of people age 0-4. (Cohen, 2011)

In the richer countries, like the United States and Europe, this process of aging is already pretty far advanced and will pose some serious questions and challenges for retirement systems. In the poorer countries, which have a younger population because they've been growing faster, this trend means more children, so higher proportion of young people, as aging will increase even faster than in the richer countries, which have already made a transition in part, the beginning of a transition to aging. An aging population is a relatively recent phenomenon. (Cohen, 2011)

More than half of Earth's inhabitants today live in cities, and two-thirds will live in cities by 2050. In 2000, a little less than half of the world's people lived in cities. Somewhere around 2007-2008, it became about 50/50. And by 2050, Cohen expects about two-thirds of the world's people to be living in cities. Now the increase in the number of city dwellers, between 2000 and 2050 is expected to be about three billion people, which was the total population of the Earth in 1960. Can current water supply provide for this shift to the cities? Can current levels of technology provide for the demand on the water supply? Virtually all of that additional three billion people will be added in the cities of the developing countries, not the rich countries. The rich cities will grow somewhat, but the really rapid growth will be in the poor or developing

countries. (Cohen, 2011)

Estimates of the number still vary widely according to the specific assumptions used. One opposing strand of thought, represented by the author Julian Simon discards the notion of a human carrying capacity altogether, claiming that the additional people will provide sufficient creativity and innovation to break through any possible natural barriers to human population growth. Simon stated: "This is the economic history of humanity in a nutshell, from 2 million or 200,000 or 20,000 or 2,000 years ago until the 18th Century there was slow growth in population, almost no increase in health or decrease in mortality, slow growth in the availability of natural resources (but not increased scarcity), increase in wealth for a few, and mixed effects on the environment. Since then there has been rapid growth in population due to spectacular decreases in the death rate, rapid growth in resources, widespread increases in wealth, and an unprecedentedly clean and beautiful living environment in many parts of the world along with a degraded environment in the poor and socialist parts of the world." (Simon, 1994) Simon points out that the Environmental Protection Agency acknowledges that U.S. air and our water have been getting cleaner rather than dirtier in the past few decades. Every agricultural economist knows that the world's population has been eating ever-better since World War II. (Simon, 1994) In the short run, logical deduction concludes that all global resources are limited. Yet standards of living have increased globally, along with the world's population since the time of the Bible and before. Adding more people causes problems, but people are also the means to solve these problems. The main fuel to speed the world's progress is our access to knowledge from libraries, the Internet and scholarly research. With such knowledge growth, combined with our ability to access this knowledge base, the limitations of access to constructive ideas come down to our

ability to desire access. The ultimate resource is people, especially skilled, spirited, and hopeful young people endowed with liberty that will exert their wills and imaginations for their own benefit, and so inevitably they will benefit not only themselves but the rest of world population. (Simon, 1994)

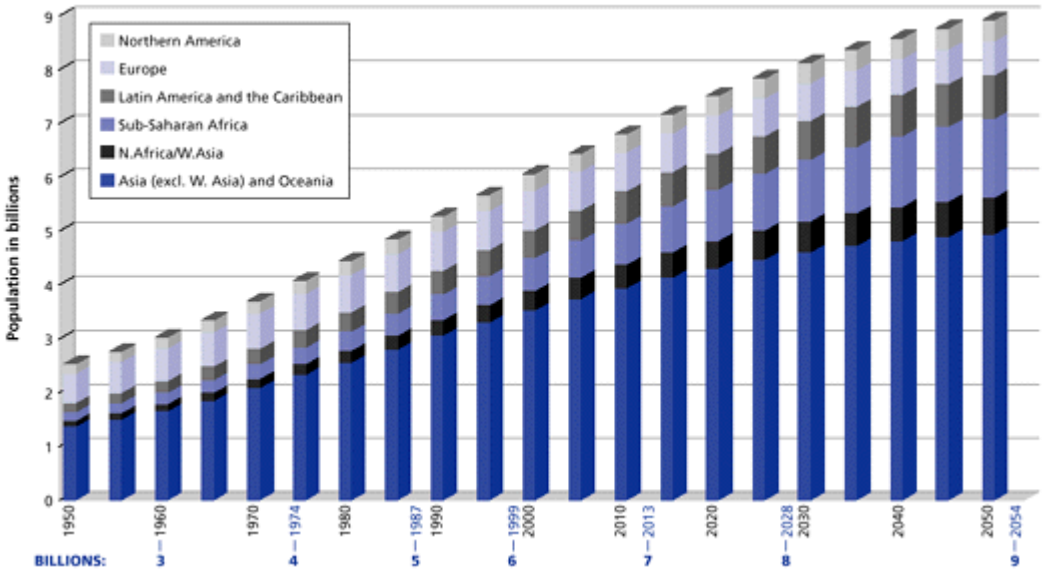


Figure # 2, World Population Growth, University of Michigan

10.1 Caribbean Islands Water Facts

Experts are sounding a new alarm about the effects of climate change for parts of the Caribbean, the depletion of already strained drinking water throughout much of the region. Rising sea levels could contaminate supplies of fresh water and changing climate patterns could result in less rain to supply reservoirs in the coming decades, scientists and officials warned at a conference in St. Lucia in September 2013.

"Inaction is not an option," said Lystra Fletcher-Paul, Caribbean land and water officer for the U.N. Food and Agriculture Organization. "The water resources will not be available." (CTV News, 2013)

Some of the possible solutions include limits on development, increased use of desalination plants and better management of existing water supplies, but all face challenges in a region

where many governments carry heavy debts and have few new sources of revenue.

Many Caribbean nations rely exclusively on underground water for their needs, a vulnerable source that would be hit hard by climate change effects, said Jason Johnson, vice-president of the Caribbean Water and Wastewater Association, a Trinidad-based non-profit group. "That's the greatest concern," he said. "Those weather patterns may change, and there may not necessarily be the means for those water supplies to be replenished at the pace that they have historically been replenished." (CTV News, 2013)

Parts of the Caribbean have been experiencing an unusually dry spell the past few years. In August 2012, some islands reported extremely dry weather, including Grenada and Anguilla. By July of this year, those conditions had spread to Trinidad, Antigua, St. Vincent and Barbados, the Caribbean Institute for Meteorology & Hydrology says.

"We're seeing changes in weather patterns," said Avril Alexander, Caribbean co-ordinator for the non-profit Global Water Partnership. "... When you look at the projected impact of climate change, a lot of the impact is going to be felt through water." (CTV News, 2013)

Intense rains have been reported in recent months in some Caribbean areas, but that doesn't mean an increase in fresh water supply, said Bernard Ettinoffe, president of the Caribbean Water and Sewerage Association Inc., a St. Lucia-based group that represents water utilities in the region. (CTV News, 2013)

Heavy rains mean there's not enough time for water to soak into the ground as it quickly runs off, he said. In addition, the cost of water treatment increases, and many islands instead shut their systems to prevent contamination.

The island considered most at risk is Barbados, which ranks 21st out of 168 countries in terms of

water demand exceeding available surface water supplies, according to a 2012 study by British risk analysis firm Maplecroft. Other Caribbean islands high on the list are Cuba and the Dominican Republic, which ranked 45 and 48, respectively. The study did not provide data on a smattering of eastern Caribbean islands that officials say are among the driest in the region. (CTV News, 2013)

"There are a number of indications that the total amount of rainfall in much of the Caribbean would be decreasing by the end of the century," said Cedric Van Meerbeeck, a climatologist with the Caribbean Institute for Meteorology & Hydrology. (CTV News, 2013)

Van Meerbeeck said water supplies will continue to decrease if individuals as well as agriculture and tourism, the region's key industries, do not monitor use. "Climate is maybe not the biggest factor, but it's a drop in an already full bucket of water," he said. "It will have quite dramatic consequences if we keep using water the way we do right now." (CTV News, 2013)

Jamaica, Trinidad and Barbados have ordered rationing this year, with Barbados reducing pressure and occasionally cutting off supply to some areas. The island also began to recycle water, with officials collecting treated wastewater to operate airport toilets. Overuse of wells elsewhere has caused saltwater seepage and a deterioration of potable water underground, leading to the construction of hundreds of desalination plants in the Caribbean. But the cost of desalination still remains unaffordable for many governments, said John Thompson, director of the Caribbean Desalination Association board. (CTV News, 2013)

The biggest challenge overall is changing the mentality of water utility authorities who see their role as solely providing clean water, Johnson said. "The new reality is that it's a national security issue if your water supplies are diminished," Johnson said. "It becomes a health and safety issue." (CTV News, 2013)

10.2 Caribbean Island Infrastructures

In her "Infrastructures of the Imagined Island", Mimi Sheller thesis is correct, well documented and stimulating. Caribbean islands are created and re-created sites of spatial innovation and fantasy where new realities are manipulated by graphic designers and marketing image makers. (Sheller, 2009) As a past resident of numerous Caribbean islands, and an investor and promoter of several resort investment properties, I give her full marks for clearly describing the virtual soft-ware enabled tourist destinations and emergence of many luxury designed, gated and un-gated communities. Ms Sheller uses a real life example of a software-enabled private island called Dellis Cay in the Turks and Caicos to illustrate her theories of how state space, informational space, and tourist space are converging in created fantasies of mobility, accessibility and the new island paradise. (Sheller, 2009)

Taking the opportunity to put her thorough document into an historical context that begins in the 1920s, I would like to add that the use of technology has also been used to market the Caribbean in the past, though the early technology was simple and uncomplicated compared to today's computer technology. Technology has evolved over the years with the marketing of resort properties in the Caribbean. Since Sir Harold Christie founded the oldest real estate company in the Bahamas in 1922, much has changed due to technological advancements. In discussions with his grandson John Christie, I learned that Sir Harold played a central role in creating Bahamas Airways, with the aim of facilitating travel and communications between Nassau and his beloved Out Islands for tourists and prospective real estate owners. The Internet was not available in the 1920s.

Confirming the trend that companies such as real estate broker HG Christie and Company established in the Bahamas, Ms Sheller points out that in the 21st century, technology such as the

Internet and computer graphic design has enabled new forms of cyber spatial property transactions and new forms of luxury property development as well as the fluid flow of funds in order to purchase these virtual properties. (Sheller, 2009)

Physical replicas and imaginary representations become reality in the virtual world of the Internet and resort design marketing material. Architecture is fluid and mobile, as it gives life to the wishes and desires of its intended clientele. I had the opportunity to discuss the marketing of a new resort in Barbados called Pure Beach Resort and Spa, with the director of marketing Mr Neil Silvert. Mr Silvert wrote that prospective investors accept the realistic images of his resort as found on the Internet, though the resort construction has not yet started. Their Internet site hosts complex virtual images of the virtual streetscapes, the Main Entrance, contemporary living room, traditional living room, the Market Place Restaurant, the Beach Monkey Bar and the Pool in a lifelike manner. Mr Silvert wrote that the resort is selling well, and commented that his investors enjoy their ability to participate in the fluid planning of their virtual properties. (Silvert, 2010)

In summation, Ms Sheller presents a well-documented and accurate account of the current trends of trans-physical and fluid architectures on island spaces of tourism and leisure resorts in the Caribbean. The mobility of the elite, of funds transfer, of communication and transportation of the changing and re-spatialization of central metropolitan urban spaces is also restructuring the evolution of the Caribbean. (Sheller, 2009) Islands are no longer fixed physical spaces. They are created, designed, transformed and expressed through new technology.

Clifton Cay, Bahamas Water Oil Pollution

(The Guardian, 2014)

10.3 Time to Address Imbalances on Small Island States

At this critical juncture, the need to redress imbalances, change incentives and improve global understanding and cooperation remains the top priority if future challenges are to be met with the

right solutions and sufficient levels of preparedness. We believe that these challenges inherent in the relationship between nature and man can only be addressed by a fundamental overhaul of current values and behaviours. The effects of these challenges will not only be felt over the coming near-term, but will also influence decision-making well into the new decade. Inherent to these problems is the fact that they concern stakeholders from all verticals and regions across the world, islands and main-lands, involving the multi-stakeholder aspect of global risk. Through our analysis of the interconnectedness between nature and mankind, we will better understand the potential challenges that lay close, which emphasizes the need for more effective global u understanding to unlock the resolution of many of the issues highlighted in this paper. However, to succeed, these resolutions will need to be supported by participants willing to reconcile often diverging agenda and able to address the long-term structural issues at hand as well as the immediate problems. Legitimacy, accountability, clarity, concerted action, and nature's supreme survival: these are the operative words of efficient global Challenge management and effective global governance. (World Economic forum, 2009)

It is now 2015. We have had activities during numerous millennia to create and cause imbalance on the landscape. The risk to our social and natural landscape is even more complex than in the past. We must urge a consideration of the longer term, global implications of risk in areas beyond their immediate and obvious implications. These challenges must be addressed collectively so opportunities can be found in their complexity.

With the recent shocks of tsunamis, earth quakes, record-setting oil prices, gold and other commodities breaking records, and the financial melt-down of 2008, 2009 and into 2010, we have been given many global events to motivate our reflection, appraisal and direction adjustment. This nature imposed pause and reflection has allowed a higher level of recognition

that global challenges are now tightly interconnected and shocks and vulnerabilities are truly global, even if impact and response can still differ at the local level. (World Economic Forum, 2009) The events of the past few years have shown how costly ineffective failures can be when they erupt in systems. The lessons learned were numerous but must be remembered and acted on in other areas, not only in the sphere of finance and economics resulting from the 2008 melt-down. Much discussion has rightly centred on behaviour change and governance, but both are highly dependent on political and individual will and the choices acted on by decision-makers. For behaviour to evolve, a concerted effort is needed to provide the right mix of information, incentives and institutions; to stretch people's time horizons and make them understand exactly what is at challenge here and now, as well as into the future.

All of this requires a longer term approach than usually dictated by electoral cycles or indeed financial reporting, Twitter feeds, Internet social networking and executive tenure. We must manage the complexity and challenges of global growth and well-being. This will take time to create the sustainable model. Unfortunately, time is one commodity that we are running out of. Our global population is growing daily, and its needs are growing as well. Yet, taking strong steps week by week, will hopefully create and strength strategies and policies which will form the foundations for the decisions taken to anticipate and manage, rather than merely reacting to challenges.

There are a number of themes that interweave in our discussions of systemic challenge with the balance between nature and humans. The increase in global interconnections among geopolitical systems means a higher level of potential challenge than ever in history. Just as mankind is more mobile than ever in history, he brings with him the ever associated level of

challenge to the balance of nature and man. By way of an example, prior to the 15th century, European civilization was not physically connected to North or South America. They therefore presented no systemic challenge to these distant cultures. Yet, with the advancements of ocean going vessel technology, Europeans were soon connected to the islands of New World.

Thus, with population mobility and new forms of communication technologies there is a greater need for an integrated and more systemic approach to challenge management and response by the public and private sectors alike. Furthermore, sudden shocks can have a huge impact, be they serious geopolitical incidents, terrorist attacks or natural catastrophes, the biggest challenges facing the world today may be from the slow disintegration of nature in the Arctic or the Brazilian Amazon. (World Economic Forum, 2009) Observing photos of the Arctic of 50 years ago, in comparison to today, will clearly illustrate that slow creeping risks are serious challenges none the less.

Because these failures and challenges emerge over a long period of time, their potentially enormous impact and long-term implications can be vastly underestimated.

These are challenges linked to big shifts that are recognized and which will roll out over many years, even decades. For example, global population growth, aging and the ensuing rise in personal foods consumption have significant implications for resources, climate change, health and fiscal policy. The emergence of multiple global players of economic and geopolitical influence is another shift. At the same time two nations, China and the US will probably play a determining role through their choice of saving and investment paths. Certainly, the recent events as the 2011 Japanese nuclear melt-down have created much short-term pressures on governments, business and individuals. Yet, are they enough to act as prime-movers for necessary reform of global governance as required? (World Economic Forum, 2009)

10.4 A Green Economy

The concept of a "green economy" will form a key focus of conference discussions on approaches to sustainable development and poverty reduction. The Bonn 2011 Process culminates in an international conference on water, energy and food security. Conceivable options here are action recommendations, specific codes of conduct for water management. This concept opens a new perspective on the role of sustainable water management. It centres on the interdependency of the water, agriculture and energy sectors and therefore seeks common solutions to the inherent and associated challenges. (Bonn Process, 2011)

The concept flows from the insight that the question of using water sustainably cannot be regarded in isolation but must be related to environmentally sound growth of core sectors of the economy and sustainable economic development. Beneath this approach is the assumption that the main water-using sectors of energy and agriculture share with the actors responsible for managing water resources a common interest in protecting these resources and using them sustainably. Development objectives in the verticals of energy security, food security and access to drinking water critically depend on whether water is available in sufficient quantity and quality. (Bonn Process, 2911)

The first task for the experts, however, is to work out how sustainable and cross-sector management of water resources can contribute to environmentally sound growth and efforts to combat underdevelopment and poverty. The results will then be translated into concrete solutions and strategies and brought into the international discussion. (Stiles, 2011)

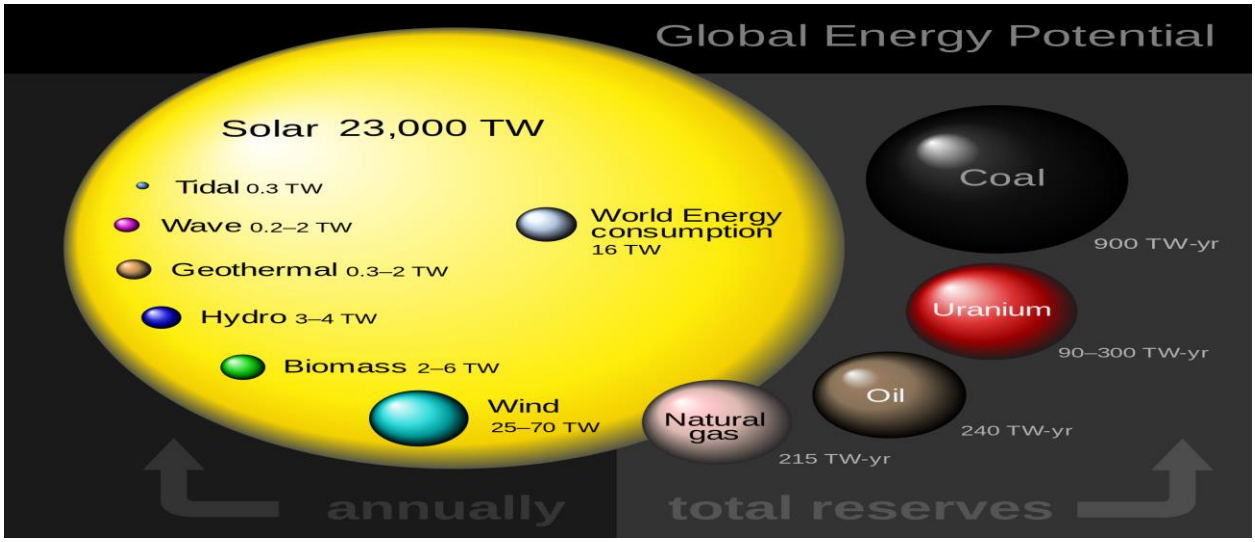
10.5 Next Generation Renewable Energy Innovation is Required

Each country must strive to build their nation's capacity to undertake world-class research and

technology development to benefit their citizens and all world inhabitants. Investment in state-of-the-art facilities and equipment, universities, colleges, research hospitals and non-profit research institutions will attract and retain the world's top talent, training the next generation of researchers, supporting private-sector innovation and creating high-quality jobs that strengthen each country's position in today's knowledge economy. The research enabled by Solar Bancorp's support is also creating and contributing to the necessary conditions for sustainable, long-term economic growth, including the creation of spin-off ventures and the commercialization of discoveries, and supporting improvements to society, quality of life, health, the environment, and public policy. We are working closely with the Solar Department of the Kharkiv Polytechnical Institute in Kharkiv, Ukraine. Together, we have developed a number of solar energy innovations and patents which take solar technologies to the next generation level of efficiencies and better costs. The key to clean, inexpensive, renewable energy is found in the Sun. As a result of energy costs being so high in the Bahamas, grid parity was achieved and surpassed in 2013. Current costs per kilowatt are approximately 50 cents, from the Bahamas Energy Corporation. Energy from solar projects can produce energy for Bahamians at less than 20 cents per kilowatt. The energy from the Sun is virtually limitless. If properly planned, the Bahamas could be a net exporter of energy to the United States, through Florida.

The graph below illustrates the global energy potential of renewable energy and other forms of energy creation. Comparison of renewable and conventional planetary energy reserves are illustrated. For renewables the yearly potential is shown in terawatts (TW), conventional sources display their total recoverable reserves in terawatt-years (TW-yr). The volume of the spheres is proportional to the amount of energy they represent. Global solar power of 23,000 TW refers to the earth's total land mass with atmospheric losses taken into account, and corresponds to 200

million TWh per year. Worldwide energy consumption of 16 TW during year 2009 translates into 140,000 TWh. Renewable energysources: Solar energy (23,000 TW) Wind power (25–70 TW) Biomass (2–6TW) Hydroelectricity (3–4 TW) Geothermal power (0,3–2 TW) Wave Power (0,2–2 TW) Tidal power (0,3 TW) Fossil Fuels of Coal (900 TWa) Oil (240 TWa) Natural Gas (215 TWa) Nuclear power(90–300 TWa) World energy consumption (16 TW) (Perez, 2009).



(Perez, 2009)

10.6 Climate Change and Islands

Combined with climate change there are many other factors on small which make people more vulnerable to natural disasters, including remoteness, environmental degradation, access to water and water quality, and seismic hazards. No one thinks of small islands as an urban population, but now over half of small island's population live in urban areas, placing an increasing stress on finite resources such as water supply, and leaving outer-island communities still more marginalized. Addressing these risks and vulnerabilities can directly contribute towards helping communities adapt to the impacts of climate change. (IFRC, 2013)

The Red Cross called on the UN climate meeting in Warsaw to strengthen community fortitude

as a first level defence for islanders. The Red Cross Societies and their branches have the comparative advantage of being embedded in communities before, during and after a disaster strikes. The Red Cross is uniquely placed to work with communities and governments, at local and national levels, on disaster risk reduction (DRR) across the islands.

In the Cook Islands, for example, the Red Cross is working with communities to prepare for cyclones, providing ropes, anchors and training so families can tie down their roofs in advance of a storm. (IFRC, 2013) The Red Cross has a huge number of volunteers and staff in 14 National Societies across the region; access to communities; is auxiliary to the government; has a wide experience in response to emergency; and strong influence at local level institutions.

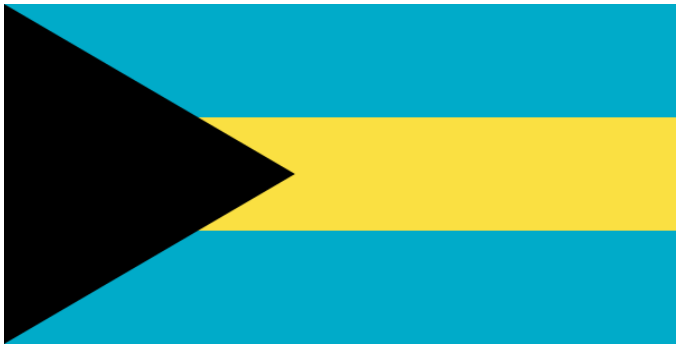
Disaster Risk Reduction groups go beyond saving lives. DRR is about building on existing capacities and protecting development gains that are a vital foundation for community resilience. It encompasses poverty reduction and the protection of livelihoods. The Samoa Red Cross Society is providing families with rainwater-harvesting kits and VIP latrines to improve access to clean water and improve sanitation. (IFRC, 2013) It also runs vegetable-garden projects which improves food security and boosts household incomes.

DRR is also about the power of education and information sharing, enabling communities to understand climate change and weather by providing simplified seasonal forecasts. Local action is the key to adaptation and empowering communities, and knowledge about climate change is crucial to informed and appropriate action. The commitment made by the Pacific Islands Forum earlier this year in the Majuro Declaration for Climate Change to intensify efforts to prepare for, and adapt to, the intensifying impacts of climate change was a commitment of note. At the Movement's biennial global congress, the Red Cross National Society leaders declared to the

COP 19 UN climate meeting in Warsaw for governments to strengthen resilience and preparedness as a first line of defence for vulnerable people in risk-prone countries. (IFRC, 2013) Bold action on adaptation is needed to help avert or reduce the worst humanitarian consequences of climate change.

In this Sept. 3, 2013 photo, Jacquelin Calvaire, 17, bathes using water from public fountain that taps mountain water in Petion-Ville, Haiti. Experts are sounding a new alarm about the effects of climate change for parts of the Caribbean: the depletion of already strained drinking water throughout much of the region. (AP / Dieu Nalio Chery)

Bahamas Flag



10.7 Closing Remarks, Conclusion and Future Considerations

In conclusion, I wish to outline the key principles and process rules entailed by adoption of managing the Nexus, identify the main implications for application to environmental review design, and illustrate this with special attentions. We will conclude with a review of the main challenges still to be resolved and, where evident, the most promising possible solutions or route to managing the Nexus in the Bahamas.

Managing the Nexus is an on-going work in process. By managing the Nexus by its very nature is an attempt at an on-going process. Therefore, this Thesis is not meant to be the last word even on the general framework for applying Nexus-based criteria in environmental review.

It is, instead, a discussion intended to provide a base for further deliberation, reconsideration and elaboration. Managing the Nexus on any Island State is a work in progress.

Decision criteria are the basic rules of the game. Effective application of the Nexus-based criteria in environmental reviews will entail at least some clarity about what the effective criteria are and how they are to be interpreted. Policy-makers and process designers have sometimes embraced vagueness as a means of preserving discretionary flexibility and contextual adjustability. Though unacceptable, constructive ambiguity can also be helpful in keeping representatives of competing interests at the table. But vagueness exists at a cost. While participants in environmental reviews such as proponents, interveners, administrators and decision makers, will appreciate the need to adapt review obligations to suit different undertakings, locales and expectations, reinventing the rules for every specific case is likely to bring intolerable uncertainty and unduly attenuated deliberation.

10.8 Call to Action for the Bahamas

The basic challenge then is to determine what rules, what more specific decision criteria, can be

identified for generic application, and what generic processes can be designed for reasonably effective, efficient and fair elaboration of detailed criteria and other decision making in individual cases. For managing the Nexus reviews of proposed new undertakings at the project or strategic levels, the key issues will inevitably surround what factors must be addressed such as social, economic and environmental effects, positive and negative, specific and cumulative, immediate and long term, proximate and distant, and how they are to be aggregated, evaluated and compared and how the individual and joint effects are to be evaluated and compared for the purposes of defending claims of net contribution to the Nexus.

10.9 Motivation and Values

Over the last decade and a half, the concept of "sustainable development" or "managing the Nexus" has been widely, if vaguely, embraced in most countries of the world, yet the Bahamas does not stand out for its progressiveness.

There has been much debate about the meaning and implications of the concept, and much criticism of the actual behaviour of institutions that have claimed devotion to it. Nevertheless, the increasing discussions, forums and presentations has proved to have created an recognizable lexicon of themes, of shared concerns and principles. And the early official commitments in rhetoric have gradually been expressed in law and policy, to the point where we now can and must begin to specify more clearly the meaning and implications for practical use.

It gained worldwide attention chiefly through the work of the World Commission on Environment and Development, known as the Brundtland Commission. (UN Economic Commission, 2005)

The Brundtland Commission stressed that the continuing environmental degradation was leading not only to local and regional resource depletion and damage to essential environmental

functions, but also to cumulative global effects. At the same time, the general failure of development initiatives in many places was leaving many people in destitution and insecurity while the gap between rich and poor deepened. This is particularly noted in the Bahamas.

In the Bahamas, the two major industries of off-shore banking and tourism have not progressively dealt with environmental sustainable challenges.

These dynamics, combined with a continuing rise in human population, pointed to a future of increasingly desperate poor islanders with little choice but to eat into their remaining natural capital, in a world which apparently could not support everyone at even a moderate western standard with current levels of technological and distributional efficiency.

In this context, managing the Nexus as a proposed solution for islands was necessarily an attack on power-based conventional thinking and practice.

It recognized that it would eventually be implosive to allow a further undermining of environmental support systems, locally and globally. But at the same time the Nexus principles demanded participation, not just to eliminate destitution and ensure material security but also to allow individuals and communities more choices and more power to exert greater control over their lives, away from the influences of sweeping globalization. Together these demand development with the Nexus notions, pursued in ways that would protect resources and environmental integrity over the long term while greatly improving human well-being, especially among the poor Bahamian islanders.

Just how this is to be accomplished has been and continues to be a matter of debate. The Brundtland Commission mentioned above emphasized giving poorer countries better access to markets in wealthier nations, using a variety of mechanisms to encourage much greater

efficiency in material and energy use, and providing some encouragements for greater economic and political equity. Others since then have adopted different perspectives and proposed different priorities and pathways.

A great deal of valuable work has been done to understand better how ecosystems work and how their integrity may be sustained. Similarly admirable efforts have gone into designing and applying more promising ways of fostering efficiency and equity, of helping communities build their own social and material resources to establish sustainable livelihoods, of addressing problems with inter-generational implications, of identifying appropriate indicators of human and environmental well-being for all sorts of communities and ecosystems, and of understanding how to design for and adapt to continuing uncertainties.

11.0 The Bahamas, A Need for Self-Sufficiency Planning and Education

The four vertical focus theme also has as its undercurrent a need for Bahamas islands self-sufficiency. Creating a sustainable self-sufficient four pillar model of food, water, energy and population can give the Bahamas a chance to provide for itself well into the future.

Yet, importing 90% of its food needs in the Bahamas is not a sustainable solution. Nor is importing all of its fuel for energy is not a sustainable solution. Even cement for building construction is imported, as are nails, lumber, and shingles.

Particular attention to cultural and political components, most common in island development applications, is meant to stress the importance of these four pillar factors in building change that may be viable over the long term. The key message of the Brundtland Commission, and the Club of Rome and other serious deliberations about the prospects for human life on this planet, is that human and environmental well-being are effectively interdependent. No matter have many layers of commerce and manufacturing are built, humans are ultimately and unavoidably

dependent on biospheric conditions that are friendly and contributory to human life. And given the huge role humans now play in controlling biospheric conditions, there is no serious strategy for preserving and enhancing the ecosystem integrity that does not also involve improving islander's well-being.

The inevitable relationship between island human cultures and their environment is a series of inter-related circles; with the circle of economy inside the circle of society, which is in turn inside the circle of nature. The dominant western culture places the economy as the ruling circle, worshiping unbridled market-led economical growth.

Yet, this emphasis has created a weak and unsustainable Bahamian economy. Nature is not the focus in the west, therefore nature is not considered as an important component in the balance between culture, the economy and itself.

In these depictions, the role of the four verticals, is to identify areas where challenges must always be avoided and improvements always sought. Thus the four vertical illustrations implies that to contribute to necessary changes, any broad agenda for the Nexus must seek positive effects on environmental, social, economic, cultural and political conditions. The Nexus agenda must seek positives over the long term. For the Nexus to prove positive it must work on all four levels of island existence, of food, water, energy and population.

11.1 Bahamas Islands in a World of Networks and Interdependencies

Managing the Nexus must realistically be perceived in an island world of networks and interdependencies. Through education and implementation corrective actions be woven together, to serve multiple objectives and to seek positive feedbacks in complex island systems. There is the opinion that the economic vertical and the environmental vertical are foundations of

warring realities. As a result, adopting a vertical-based approach to the Nexus tends to focus attention on competing objectives, rather than on needs and opportunities for positive accommodations of interrelated human and environmental interests in the Bahamas.

Nature and human well-being is totally dependent on the integrity of environmental systems, at every scale from the local to the global. We rely on the key life support functions of these systems, and on the resources and conditions that these systems exist. Humans are unavoidably participants in the island's environmental systems.

Human activities are major components in all island systems. Human actions have been important factors in nature. Our intentional and unintentional influences clearly stress and alter environmental systems, and degrade or deplete crucial resources at the global as well as regional and local scales. These human threats are expanding daily. We know much less about the environmental systems and our influences on them than we need to know for confident prediction, intervention and manipulation. It is nonetheless clear that several factors representing our largest threats to island system integrity, energy and material consumption levels, waste generation including greenhouse gases, human population numbers and consequent demands for material sufficiency and luxury, are now growing and are expected to continue to expand for some time, even under the most optimistic scenarios for environmentally responsible correction. Existing key island life support functions therefore entail attention not just to the integrity of environmental systems but also to the integrity of human systems and their relations with the larger environmental whole.

11.2 Reducing Threats to the Integrity of the Bahamian Environment

Some Bahamian activities undermine the integrity, and potential long term viability of the whole. Yet, not all resources are over-harvested and perhaps not all ecosystems are subject to stresses

that threaten their integrity. The big indicators suggest that we are now on the brink and that we are obliged for self-preservation as well as by prudence to pay much more attention to preserving Bahamas environmental and ecosystem integrity. The integrity principle does not merely entail that human-induced stresses on environmental systems must be generally reduced, though this is certainly important.

The Bahamians need to reduce the indirect and overall as well as direct and specific threats to system integrity and life support viability. To do this they need to adjust and reconstruct their human systems to establish more modest, sensitive and flexible relations with the environmental systems upon which we depend. The key for all this is acceptance that existing the planet's life support functions involves attention to the integrity of the balance of human and environment.

The Brundtland Commission defined sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This is, perhaps unavoidably, a vague definition that has proven to be open to a host of interpretations. But it does capture the link between environmental and human well-being and many jurisdictions have incorporated it, more or less verbatim, into law and policy, including those establishing environmental Review processes for evaluating proposed "development" undertakings. (UN Economic Commission, 2005)

Future needs and their implications are clearly more difficult to define and represent. For example, uncertainties about the likely nature of coming technological developments, and their negative as well as beneficial effects, make it difficult to know what depletable current resources will be most important in the future. We can, however, confidently assume that maintenance of key environmental systems and environmental functions will be critical, and that while some

technological innovations will find substitutes for current resources others will find key new uses.

Many Bahamians now live in conditions of serious material deprivation, no power, no water, economic insecurity, and tightly constrained opportunity because of material want, typically associated with and exacerbated by limited influence in collective decision making at all levels from the family on up. Meanwhile the gap between rich Bahamians and poor Bahamians is widening. According to the United Nations Development Programme, the richest fifth of the world's people consume 86 percent of all goods and services, while the poorest fifth make do with 1.3 percent.(UNEC, 2005).

Bahamar is scheduled to open in July 2015. Yet, where will the electricity come from? The utility has not increased its capacity to accommodate Bahamar. Currently, there are many thousands of families who are not serviced with electricity in the Bahamas. This absurd and situation can only be chalked up to ill planning, or no planning. The public utility has been for sale for five years, yet there are no takers. During the week of March 15, 2015, Bahamar and the Bahamian utility did a test run of the electricity requirements. The city of Nassau was blacked out for three days.

Similarly, when the annual total needed to provide clean water and safe sewers for the world's population is $9 billion, annual European spending on ice cream is $11 billion.(UNECE, 2005) . If savings in one area merely facilitate more material or energy consumption elsewhere, there is no net gain. If the savings go into more consumption by the already affluent, prospects for the Nexus are likely to decline. Certainly efficiency gains cannot be sufficient by themselves. And they will provide net reductions in overall material and energy use only if tied into broader efforts to de-couple well-being and consumption, that is, to show how improvement

of human well-being can be achieved at the same time as reductions in material and energy consumption.

It remains that substantial efficiency improvements are possible and necessary as part of the Bahamas Nexus agenda. But initiatives to reduce material and energy throughput will be useful only if designed and implemented in comprehensive approaches that seek overall gains and consider the distribution of benefits.

11.3 Education and Physical Infrastructure

Better governance is a prerequisite and probably also a product of steps towards the Nexus. Notions of island Nexus demands better understanding of complex, intertwined and dynamic conditions, both social and environmental. It requires us to be more thoughtful, open and flexible, able to examine our capacities and objectives in a more integrated way, with more humility, more far-sightedness, and more commitment to continuous learning and adjustment. Education and equitable empowerment at the community level in ways that are respectful of local knowledge and other assets have been demonstrably effective means of enhancing individual and collective well-being. This suggests a consequent need to strengthen individual and collective understanding of ecology and community, to foster customary civility and environmental responsibility, and to build civil capacity for effective involvement in collective decision making.

11.4 Resistance to Change

What happens in any one area is closely linked with what happens in all of the others. Because of these linkages and interdependencies, positive steps in all areas are required, for the long term. Yet, changing historical linkages and interdependencies will create a tension of resistance.

There can be doubtful long term promises in a balancing strategy that accepted some further incremental widening of the gap between rich and poor on the grounds that it was softened by some equity-related restrictions in trade liberalization deals meant to serve wealth generation and efficiency goals What happens in one area affects what happens in the others.

There needs precise actions to avoid the perils of continued unsustainable behaviour. These improvements rely on linked, mutually supporting, positive steps on all fronts. In the political world of island states, and everywhere however, most decision making involves compromises and trade-offs. Managing the Nexus practice is not excused from the challenges of compromises and political expediency.

Environmental and economic ends were assumed to conflict. Environmental protection cost money; attending to environmental concerns creates an economic sacrifice.

It is argued that commitment to environmental responsibility is a good indicator of corporate economic prospects. But that said, social and environmental improvements do often involve immediate costs and the benefits may be distant and distributed beyond the initial investors. (Porter, et. Al., 1996)

11.5 Different Interest Groups Interpret Different Conclusions

Even where the Nexus objectives are widely understood and commonly accepted, different interests are likely to reach different conclusions about which of these compensations and net calculations may be justified. The answers often also depend on the details. In Clifton Cay just outside of Nassau, there was a large oil slick created by the local oil company as it was disembarking oil from an oil tanker. The different interest groups were addressing the slick, that is as far as their common linkage went. The community group used the slick as a lever to push for the closure of the refinery. The refinery used the slick to push the government for a better wharf to unload their oil.

Just how serious are the losses, risk, gains involved? Just how inequitable is the distribution of effects? Islanders research such questions daily. If they have the resources they can utilize elaborate tools such as systems analysis, scenario-building, cost-benefit analysis, risk Review, multi-stakeholder negotiations, all able to better assist the review process. While all of them are more or less non-conclusive and inherently flawed, their mere existence testifies to the common need for island interest groups to create detailed, empirical specific research. Commitment to island Nexus objectives entails attention to a wider and more complex set of considerations than is now common in most environmental review regimes. In Nexus based reviews, significance judgments must be applied to positive as well as negative effects, enhancements as well as mitigations, uncertainties as well as confident predictions, and systemic as well as particular interrelations among long and short term environmental, socio-economic, cultural, and other factors.

It is important to remember that every action creates a reaction. Sometimes these reactions are positive and constructive, and sometimes they create island community polarity.

11.6 Limits to Democracy

It is important to build human-environmental relations to promote the integrity of environmental systems in order to up-hold the irreplaceable life support functions upon which sustainable island human well-being depends. Sufficiency and opportunity ensures that everyone has enough for a decent life and that everyone has opportunity to seek improvements in ways that do not compromise future generations' possibilities for sufficiency and opportunity.

The process is the gradual accommodation to an island world of complexities, interconnections and choices. We have been slowly forced to accept that socio-economic and

environmental aspects of environment are too intertwined to be usefully treated as separate areas of concern. With one comes the other.

Supposed knowledge can only help in some ways and that islanders must apply their own values. For Bahamian islanders who adopt Nexus-based goals, it is an important step in focusing on the inter-relationships of their island. Recognizing the these island networks and how they are linked with strengthen the Nexus self-sufficiency processes as they apply unique values with a better understanding of context and possibilities for the future.

The social and economic fabric is unique in each island state. The underlying differences of power, religion, language, education, and context, challenged by the usual jealousies and suspicions of power, will frustrate hopes of quick solutions, as it always has. Yet, through communication, such diversity will be recognized as more valuable than is generally recognized. In the case of the Bahamas their Charter of Governance declares their short comings, their goals, their anticipated undertakings and address other present political imperatives. It was declared by the ruling party, so it can be viewed with suspicion. Yet, it used its effective political platform tool for dissemination of this doctrine.

Some established authorities may respond negatively to Nexus-based demands for integration of considerations and across-the-board positive effects, arguing that is not how things work. These negative reactions will certainly come from the positioning of the opposition party. Nevertheless, statistics tell all. The Bahamas import 90% of their food. Is that a good thing? The Bahamians power their country by a depleting resource, which is running out. They have more sun heat units than Germany and Canada, yet are not using the sun to create energy. Things that are established are not working. That is why the Nexus ideas has emerged. And that is why serious efforts in the Bahamas to specify and otherwise facilitate application of

Nexus principles are needed now.

The Charter of Governance stated, the country is far worse off now than in 2007, the year that the ruling party lost the election. Not only is this proven by the down-grading of the country's credit standard by two international rating agencies, both Moody's and Standard & Poors, but by the candid warning from the International Monetary Fund that the plans of the old party (FNM) are not sufficient to reverse the rising $4.25 billion dollar national debt and fiscal deficits to average 4.25 percent of GDP over the next four years; and that the borrowings associated with the government's infrastructure program had made the fiscal position more vulnerable, and was set to cause the public debt to GDP ratio to reach 69% by 2016, up from less than 37% when the FNM came to power in 2007. (Charter of Governance, 2012)

11.7 Bahamas Finest Resources are Leaving by the Boatload

When two-thirds of college and university-educated Bahamians move abroad to seek jobs in developed countries, this costs this nation a sum equivalent to 4.4 per cent of annual gross domestic product. (Tribune, 2014)

Similar to Canada's Maritime Provinces, the Bahamas is experiencing a 'brain drain' which was highlighted in a newly-released Inter-American Development Bank (IDB) report. This Report noted that 61 per cent of tertiary-educated Bahamians had left this nation for jobs in Organization for Economic Co-Operation and Development (OECD) member countries.

The study, 'Is there a Caribbean Sclerosis', attempts to determine why economic growth in the Bahamas and five other regional nations has been stagnating, effectively suggests this nation is losing its 'best and brightest' minds to other economies. (Tribune, 2014)

Bahamas' 'Brain Drain' has significant implications for the productivity, innovation and creativity of Bahamian firms and the wider economy, all areas where it is suggested this nation is not as competitive or sustainable as it might be. The cost of educating these young Bahamians is a considerable lien on the economy of the Bahamas, as well as a poor investment of scares government capital.

The IDB report's authors, Inder Ruprah, Karl Melgarejo, and Ricardo Sierra, summed it up by noting that the Caribbean countries have lost more than 70 per cent of their labour force with more than 12 years of schooling through emigration. (Ruprah, I., et all, IDB, 2014)

Ironically, all countries stress the positive contribution of education to economic growth. Yet, Youth migration negatively affects the Caribbean countries' ability to generate economic growth and jobs. The IDB study pegs the combined impact of this 'brain drain', plus the money spent on these Bahamians' education, at 4.4 per cent of GDP. With Bahamian GDP currently estimated at around $8 billion, the 'dollar value' of that 4.4 per cent is around $350 million. (Tribune, 2014)

The IDB study said this nation collectively lost 40 per cent of its GDP between 2008-2012, based on 2007 growth levels, with only Trinidad fared worse.

Also ironic, as a result of gaining their independence small, stable Caribbean societies such as the Bahamas fostered the creation and embedding of growth-retarding special interest groups. As a result, there is "a lower level of public trust of politicians, more unproductive rent-seeking, and a greater degree of wastefulness in government spending. Government officials engage in more diversion of public funds, show greater favoritism, and Caribbean

businesspersons make more irregular payments and bribes. The only area where Caribbean tourism-based countries are at the same level as their small island states counterparts is judicial independence.

Therefore, the much-touted pride for their recently gained political stability may have created the environment of corruption and graft, which in turn stifles sustainable economic growth. The Caribbean states such as the Bahamas may be good for a select few businesspersons but not necessarily good for country-wide businesses.

In the years since the plantation economy there has been marked divergence in the directions of Caribbean economies. On the whole the smaller, service-based economies and energy-rich Trinidad and Tobago have progressed rapidly; while the larger, resource based economies have suffered reversals or stagnated. Tourism and international financial services have grown, traditional agricultural exports have declined, migration has intensified, the informal economy has mushroomed, and remittances from the Caribbean Diaspora and narco-trafficking have become significant foreign currency earners. (Ruprah, I., et. al. 2014)

The economies that have done well in recent years are those that are nibble, and well-endowed for expansion into new export staples and new energy sources; while those that have not, remain mired in the production of older staples.

Thus, when natural resources are depleted or foreign demand shifts, the economy is in a position to switch capital and labour to new activities. Their current booms cannot last forever. A similar challenge confronts the stagnant economies.

In this sense, all small Caribbean island economies are on a similar beach. Though the Bahamas are merely 60 miles from Florida, USA, they may not survive the climate changes of higher

waters; their lack of renewable energy as imported power becomes more and more expensive; the lack of fresh food, that currently is 90% imported from away; or the lack of new era technology planning that could offer young Bahamians the opportunity to stay home and develop skills and contributions to a healthy future for their homeland.

Recently, Dr Candice Deal PhD, from a prominent Bahamian family of many generations has decided to leave the employee of her New England university in Massachusetts and return to her home country of the Bahamas. She has made the decision to come home and contribute to her country's Nexus survival. I hope that Dr. Deal's decision is the decision of many of her countrymen and women, who went away to procure an excellent education and new experiences, and now wish to use their substantial gifts and talents to provide a sustainable future for their birth right – their Bahamas. Dr Deal has chosen not be to a modern day pirate, but rather an educator, bridging the old paradigm with the new opportunities that technology can provide.

Our four Research Questions did not prove up a strong score card for the Bahamas. As a matter of fact, the Bahamas failed the test. Yet, with Bahamians coming back to their homeland like Dr. Candice Deal, to lend an educated hand full of North American experiences, there is hope that her country will turn the corner with committed zeal, not just posturing and political rhetoric. It can be 'Better in the Bahamas' with concerted action.

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